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the OIL AND GAS JOURNAL

PUBLISHED WEEKLY

NOV. 16 1959

STEEL OUTLOOK: Plenty in 90 days p. 129

Two panels of experts look at future p. 136

Detonative explosions need more study p. 145

How to select a gasoline-recovery plant p. 186

Jersey's top man takes over as API chairman

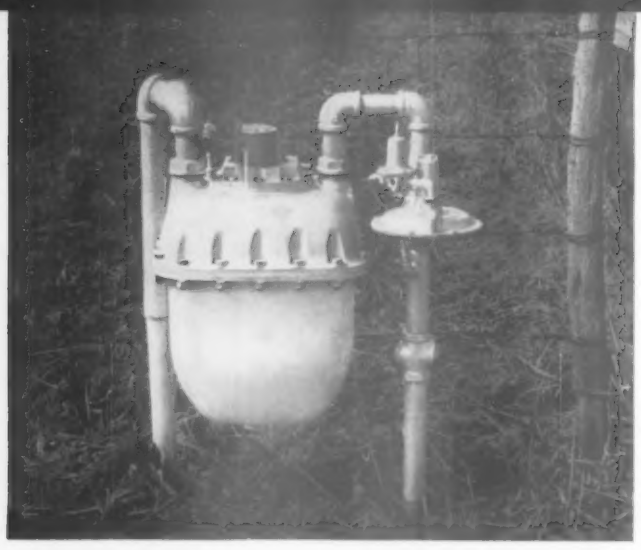
SPECIAL NEWS REPORT p. 109

It's portable, It's corrosion-resistant

It's the ROCKWELL "1600"

ALUMINUM GAS METER

for measuring field gas at up to 100 psi working pressure



Rockwell "1600" meter with Rockwell "173" regulator (pilot loaded), on field service in Texas.

The Rockwell "1600" is tailored to the job of measuring gas sold or used on the lease. It weighs only 63 lbs., so one man can easily carry and install it. The sturdy aluminum outer case withstands weathering and takes bumps and knocks in stride. There's a generous capacity rating of 1600 cfh at 4 oz. inlet pressure. This capacity can be materially increased by measuring gas at higher pressures . . . up to 100 psi. Corrections to base pressure for volumes measured at higher pressures can be made by equipping this meter with either a Rockwell Emcorector or a Combined Record Gauge. Write for full details to Rockwell Manufacturing Company, Pittsburgh 8, Pa.

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Inter-Company Reports • Pipe Line Taps • Irrigation Fuel

ALUMINUM GAS METERS

another fine product by

ROCKWELL

OIL AND GAS JOURNAL
Vol. 57 No. 47

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Annual index available on request.

TECHNOLOGY—OPERATION

Refining-Processing

Detonative Explosions Need Close Study 145

By R. B. Jacobs

It is believed that almost all flammable gaseous hydrocarbon-air mixtures can detonate and that flammable hydrocarbon mists in air will detonate. Disasters can be avoided only by carefully guarding against all conditions which can result in the presence of flammable mixtures within operating units. If air or oxygen must be used, its concentration must be known at all times and must be rigorously controlled.

Coke Drums Go Up at Expanding West Coast Refinery 148

To Prevent Detonation, Eliminate Oil-Air Contact on Startup 149

By O. A. Pipkin

An analysis of the detonative early explosion which rocked the Cities Service refinery at Ponca City, Okla., early this year leads to these conclusions: (1) detonation can occur in any place where air is present; (2) the startup is the most vulnerable period; (3) startup procedure for all units should be thoroughly reviewed; (4) problems of human error, even with the most experienced operator, still exist; (5) side-by-side operating units are undesirable; and (6) grating for platforms probably makes less-destructive missiles than floor plate.

New Process for Removing H_2S from Refinery Tail Gas 158

The California Co.'s Perth Amboy, N. J., refinery is using a simplified process scheme to remove sulfur from refinery tail gas. The preliminary oxidation step has been combined with a waste-heat-recovery boiler into one compact unit. Heart of the installation is a new highly efficient water-cooled boiler-burner unit.

New Flare Stack Burner Resists Buckling, Corrosion 160

Questions on Technology 165

New American tanker rates which revise and correct older USMC rates are now available.

How to Select a Gasoline-Recovery Plant 186

By Robert F. McNamara

Adsorption-type gasoline plants are proving to be economical at much higher gas throughputs than the operators originally thought they would. Both absorption and adsorption processes should be examined carefully when both dehydration of a gas system and gasoline removal need to be carried out.

Production

Bottom-Hole Heating Helps California's Heavy-Oil Production 154

By D. H. Stormont

Bottom-hole heating is being used by more than 340 Tidewater wells at Kern River, Midway-Sunset, and other low-gravity fields in California's San Joaquin Valley. Its use is causing production increases of approximately 5,000 bbl. daily. For older wells, average daily oil increases have been about 13 bbl.

Drilling

Why Rock-Bit Bearings Fail 166

By G. R. King

This important report sums up years of testing work done on rock-bit bearings. The author and his associates learned that many of the most common materials in drilling mud drastically shortened bearing life and, as a result, hike the cost of our wells. These findings have led many to believe that sealing bit bearings to keep drilling fluid out is the next important step in making drilling cheaper.

Pipelining

Modernizing Old Horizontal Compressor Engines 192

A three-point modernization program is increasing the efficiency of the horizontal low-speed-type internal-combustion engines on the Cities Service Gas pipeline system. The program includes a new ignition system, improved oiling system, and improved bearings.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Nov. 16, 1959

General tone of the API gathering was optimism:

Speakers on programs and oil men talking in corridors all felt pessimism of last year or so has been overdone.

Oil is still a profitable industry with good long-range outlook for growth (See API news coverage beginning on p. 109)*.

Gleanings from the meetings:

...Refinery runs need tighter management.

...Refinery overcapacity will end by 1964-65 due to construction slowdown as well as demand growth.

...World production oversupply may end within 3 to 5 years when demand catches up.

...Capital expenditures must be conserved, other costs pared to offset inflation. Price of crude and gas must rise.

One note of optimism:

API attendance set a record. Some 6,605 registered for the sessions. Previous record was 6,477 in 1954.

▼ ▼ ▼

Third-quarter doldrums hit oil harder than most.

National City Bank of New York reports this comparison: Oil firms showed about same or less profits in third quarter as last year. Other industry groups all were up from 9% for food to 73% for rubber.

For first 9 months, oil gained 14% compared to 43% for all manufacturing and 36% for all industry groups.

▼ ▼ ▼

Don't expect oil-country steel goods overnight.

This is the general outlook, provided no new labor troubles develop at the mills:

...Orders placed before the strike will be filled in a month or 6 weeks.

---

*Refers to article in this issue giving more details. Where no page is given, the item is exclusive in the Newsletter.

...Orders placed now won't be filled before late February or March.

Most steel men believe a settlement will be reached during the 80-day cooling-off period which will assure continued operations (p. 129).

▼ ▼ ▼

You can expect concentrated research for a new agent, miscible with both oil and water which can be used economically in big volume in secondary-recovery projects.

Need stems from some poor results in the field with the LPG-slug type of miscible drive. In them a bank of injected LPG is chased with gas. Most such projects have experienced fast channeling of gas through the LPG bank.

This has convinced engineers that variation in reservoir permeability is tougher problem than first thought. Irregular permeability would be less of a headache if water's more favorable mobility rate could be used as the miscible-drive force.

Sohio is moving slowly in forming world's largest water flood in midsection of Spraberry Trend Area field.

Copies of operators' agreement have been mailed to companies holding leases on nearly 61,000 acres. Push to get royalty owners on dotted line probably will start in 60 days.

Sohio may not take unit before Texas Railroad Commission until next summer. Best bet is that Sohio will wind up with about 85 sections or 54,000 acres. Some operators are expected not to sign.

Operators in Midkiff area of Spraberry are moving fast to form another unit covering 25,000 acres. Second and larger Humble unit is going more slowly. Other units are planned by Mobil, Cities Service, and Phillips.

▼ ▼ ▼

Russians have offered Iran an 85% profit split for an oil concession in northern Iran.

The condition: Iran will not allow a foreign power to set up military bases anywhere in its country.

Russia's last effort to get into Iranian oil came just after World War II when Soviet troops still were stationed in the land. It fell through because of Allied opposition.

▼ ▼ ▼

Drive for compulsory unitization next year is shaping up in Kansas.

Most oil men and conservation officials want it.

They expect subject to be hot political potato and a difficult issue to get through the legislature.

New water floods in Kansas are having to operate without

special allowables.

The restriction isn't cutting down on number of new floods, however.

With the oversupply of crude trimming production, Kansas officials decided any new floods would be approved only if they were engineered to operate under a 25-bbl. limit. Requests for special treatment consistently are being denied.

One recent case: Company proposed a flood which in 1964 would require production of 49 bbl. per well. The application was denied. It was proposed anew under a 25-bbl. limit and approved.

Said the company: We'll hope that when we have to have 49 bbl. a day the market will permit it.

▼ ▼ ▼

Exploration abroad: Signal Oil & Gas has closed down its exploration office in Venezuela because Government says no new concessions will be offered...Union Oil has season's first oil strike in northeastern British Columbia. Its B-42-1 Aitken Creek flowed 35-40 bbl. in hour test...Important strike is reported at Imperial 10-13 Virginia Hills 6 miles southwest of Judy Creek. It may open up tremendous area for exploitation to link Judy Creek, Virginia Hills, North Whitecourt...

And at home: Biggest news in Rockies is Pure gas and condensate discovery at Northwest Lisbon in Utah part of Paradox. Total 541 ft. of Mississippian pay is indicated, Devonian shows found...Union Pacific Railroad will do first wildcatting under own name in Wyoming. It plans offsets to northwest and southeast of West Desert Springs...Pure-Monterey 1-D Federal in northern Lea County, New Mexico has earmarks of a big find. It has cored 88 ft. of porosity in Devonian rocks and has flowed at rate of 2,112 bbl. daily... Mobil has backed up and sidetracked fish at 1 Kathleen Moore deep test in Pecos County, West Texas.

▼ ▼ ▼

Pipeliners note: No major transportation legislation is expected for the next Congress.

This is the view of Rep. Oren Harris (D-Ark.), chairman of House committee on interstate and foreign commerce.

Pipeline automation progresses on two fronts:

...One products line has built an installation for direct truck loading from a trunk line. (Another pipeline had looked at the practice and backed off.)

...A big crude system is going ahead with automatic tank switching, an industry first.

New pipelines being built in Germany's Ruhr will hurt other types of oil transportation.

Crude traffic on the Rhine has been cut in half by the new Wilhelmshaven-Cologne pipeline. It will virtually end when a system from Rotterdam opens next year. Railroad traffic also is being hit.

Texas' new severance beneficiary gas tax is being paid under protest by all but one big pipeline.

Exception is United Gas Pipe Line which paid in $88,450 for its first full month of operation under the new levy.

Four suits already have been filed attacking the tax. Plaintiffs are Michigan Wisconsin, Transcontinental Gas, Panhandle Eastern, and Northern Natural.

▼ ▼ ▼

First commercial hydrodealkylation plant to make synthetic benzene and napthalene from petroleum is planned by Ashland Oil & Refining at its Buffalo, N. Y., refinery.

New unit will produce either 12 million gallons per year of benzene or 50 million pounds of napthalene or a combination of the two products.

Amoco's El Dorado refinery is back on stream after 134-day strike shutdown.

New contract with OCAW calls for upward revision in a few wage rates and improvements in severance pay and other fringe benefits.

On the touchy clause governing working conditions, both sides said the new contract clarifies the responsibilities of both parties in refinery operations.

Actually the new clause affirmed company right to require employes to do incidental small jobs not covered by employes' classification.

Pure Oil has the answer to excess refinery runs. It has closed down its Toledo refinery for a month.

The announced reason was to allow product inventory to fall into line with reduced seasonal demand.

Jersey Standard reaffirms its faith in research and engineering at Florham Park dedication.

Reason: Every $1 Jersey spends on developing new products or improving technology brings about $5 in return.

Price on Cut Bank and Darling crude in Montana is off.

Carter posted 25-cent a barrel reduction with a 3-cent instead of 2-cent downward gravity differential. This makes the cut on 21°-gravity crude or below 45 cents a barrel.

The Carter action followed similar cuts made earlier by at least two other buyers in the region. Price range now is a $2.73 per barrel top to $2.13 low.

YOU GET MORE KNOW-HOW WHEN YOUR "SPECS" READ HYATT

because HYATT has built *millions* more cylindrical roller bearings than anyone else for two thirds of a century. And every year for the last 67 years we have learned to make them run longer, smoother, more reliably. Remember, *no bearings carry radial loads like cylindrical bearings—and nobody knows them like HYATT.* Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT *HY-ROLL BEARINGS*

IN ROLLER BEARINGS HYATT IS THE WORD FOR GM RELIABILITY

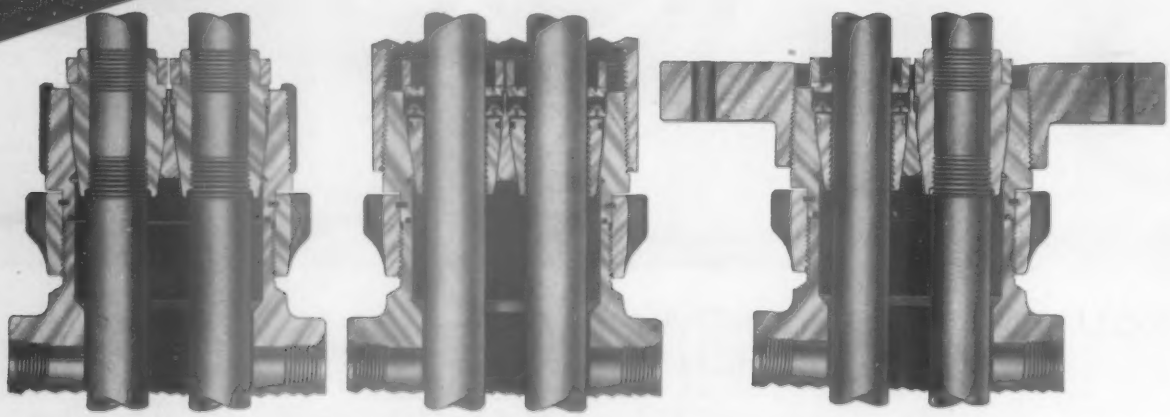
For Flexibility & Economy in Dual-Completions

The KA-4 Tubing Head is the Answer

NEW

Multiple Use . . .
Optional Suspension
Slip or Mandrel
Combination . . .
API Safety Thread

4000 Lb. Test Pressure — 2000 Lbs. Cold Working Pressure



Mandrel Hangers | Slip Hangers | Slip and Mandrel Hangers

NORRIS HINDERLITER
WELL HEAD EQUIPMENT

W. C. NORRIS, MANUFACTURER
DIVISION OF DOVER CORPORATION
TULSA, OKLAHOMA

BRANCHES: Great Bend, Kansas; Corpus Christi, Houston, Kilgore, Odessa, Wichita Falls, Texas; Oklahoma City, Oklahoma; Salem, Illinois; Casper, Wyoming; Farmington, New Mexico; Edmonton, Alberta, Canada.

Buy From Your NORRIS Distributor

B.F.Goodrich hose still on rig after 2½ years, 200,000 feet

THE B.F.Goodrich rotary drilling hose hanging on that rig gets rough treatment both inside and out. Its cover scrapes against the derrick, is exposed to extremes in weather. Abrasive, oily mud rushes through it. Abuse like this caused the previous hose to wear out in a year. But after 2½ years and 200,000 feet of hole, the B.F.Goodrich hose is still going strong, hasn't caused a minute of downtime for maintenance.

This B.F.Goodrich hose, called "Highflex", has a thick, tough cover that stands more punishment, lasts longer on the rig. It resists gouges, scrapes and tears. Sun, wind and rain won't weaken it. Oily mud will not cause swelling or rotting of the tube.

Highflex hose is also built to take extreme bottom hole pressures. Spiral-wrapped cable wires used for reinforcement make it burst-resistant, qualify it for Grade C (5000 lbs. test pressure) American Petroleum Institute. Hose ends are reinforced with additional plies of wire and fabric to protect against bending stress, prevent hose blowouts at the coupling.

Strong as it is, B.F.Goodrich Highflex is also the most flexible hose made for heavy duty service. It's easy to attach to the rig, hangs well from the standpipe, coils easily without kinking.

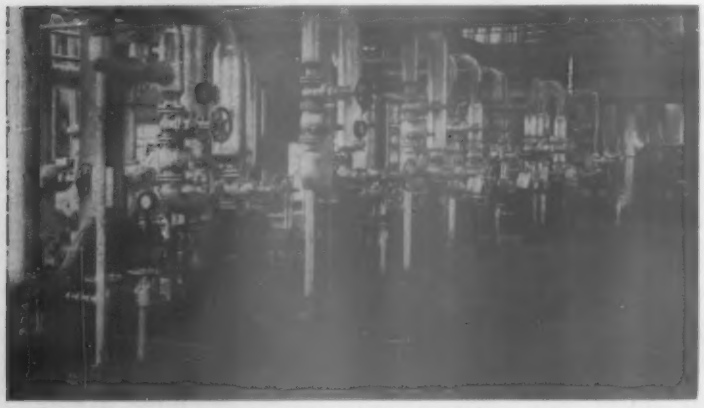
You'll find B.F.Goodrich Highflex hose at leading supply stores in the oil field, or at any of these B.F.Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Shreveport, Hobbs, Oklahoma City, Tulsa, Corpus Christi, Dallas, Houston, Kilgore, Odessa, Wichita Falls. *B.F.Goodrich Industrial Products Company, Department M-722, Akron 18, Ohio.*

B.F.Goodrich ***rotary drilling hose***

80 Wilson-Snyder ES Centrifugal Process Pumps help keep Texaco's new Puget Sound Works on stream!

Shown are heavily lagged Wilson-Snyder 2 x 3, 2-stage ES pumps handling hydrocarbons at 183 gpm and 902-feet differential head. Wilson-Snyder pumps of other sizes are available for similar services with capacities from 15 to 2000 gpm.

Ten Wilson-Snyder Pumps are in Texaco's new polymerization plant in the Puget Sound Works, the largest being the 3 x 4 x 8½ ES shown in front. Pumps in this plant handle fluids of varying specific gravities under a wide range of temperatures and pressures and have capacities from 40-400 gpm.



This installation is at the crude unit. Eleven Wilson-Snyder Pumps, both steam turbine and motor driven are in service here handling fluids with temperatures up to 691 °F. at capacities from 15 to 515 gpm.

80 Wilson-Snyder Pumps in 11 different sizes have been installed in Texaco's new, modern refinery at Anacortes, Washington. They will perform under a wide range of temperatures, capacities, specific gravities and pressures.

In spite of the varied types of service conditions, the 80 pumps do not require a large stock of maintenance parts. All 11 pump sizes can be serviced with only *three* sizes of bearing bracket assemblies, including shafts, sleeves, bearings and packing. What's more, nine other Wilson-Snyder pump sizes can also be serviced from these same three bearing bracket assembly sizes.

This interchangeability of parts means low inventory investment for overall maintenance. You, too, can save money by standardizing on Wilson-Snyder Process Pumps for all requirements within the scope of their application.

Wilson-Snyder Process Pumps are designed for applications up to 900°F., suction pressures to 600 psi, and discharge pressures to 750 psi. They are furnished in 20 sizes from 15 to 2,000 gpm, 50 to 1,100 foot head, and 2 to 250 horsepower.

USS, "Oilwell" and Wilson-Snyder are trademarks

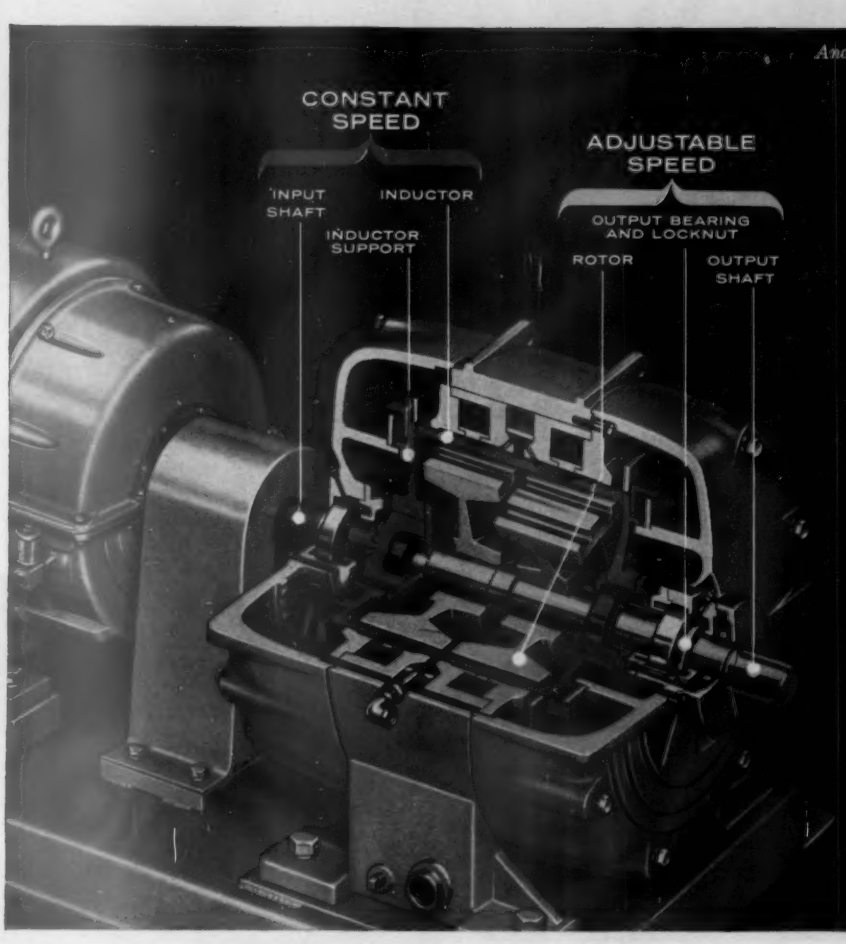
Convenient Application Advice

. . . on Wilson-Snyder Process Pumps can be arranged through your nearest "Oilwell" Branch . . . or direct from WILSON-SNYDER SALES ENGINEERS at . . . Chicago, Illinois . . . Dallas, Texas . . . Houston, Texas . . . Los Angeles, California . . . New York, N. Y. . . . Tulsa, Oklahoma . . . Pittsburgh, Pa.

USS

Wilson-Snyder Works
Oil Well Supply
Division of
United States Steel

Another new product from Louis Allis



Two-field construction shown. Also built in one-, three-, and four-field construction with or without magnetic brakes. Simply specify your hp and speed requirements and Louis Allis will tailor the drive to your need.

Expert field application engineering

VARIOUS MOUNTING STYLES AVAILABLE

The new Louis Allis MAGNETIC DRIVE

A compact, adjustable speed drive up to 2000 hp!

Based on a liquid-cooled magnetic coupling design, the *all-new* Louis Allis Magnetic Drive offers you the finest in precise regulation, compactness, and design flexibility for adjustable speed drives up to 2000 hp.

A unique annular cooling manifold provides effective heat transfer. It eliminates "water-drag" since there is *no* liquid in the air gap between the constant-speed and adjustable-speed members. There's no "flooding" the Magnetic Drive or forcing of water into bearings. And you'll *never* find condensation in the bearings. The reason: a planned flow of air through the drive reduces bearing temperatures and exhausts any condensation which might occur as the unit cools off after use.

Stationary field construction eliminates slip rings. All bearings can be lubricated without disassembly, and grease chambers provide ample grease reservoirs. Coils and lead connections are encapsulated in a chemical- and heat-resistant polyester — and simplified construction eases inspection and servicing. The *all-new* design permits simple relocation of cooling inlet, conduit box, discharge, etc., regardless of direction of rotation.

If your plans call for adjustable speed drives — specify Louis Allis Adjustable Speed Magnetic Drive. Write for a copy of Bulletin 3650 — now available at your Louis Allis District Office, or from The Louis Allis Co., 449 E. Stewart Street, Milwaukee 1, Wisconsin.

LOUIS ALLIS

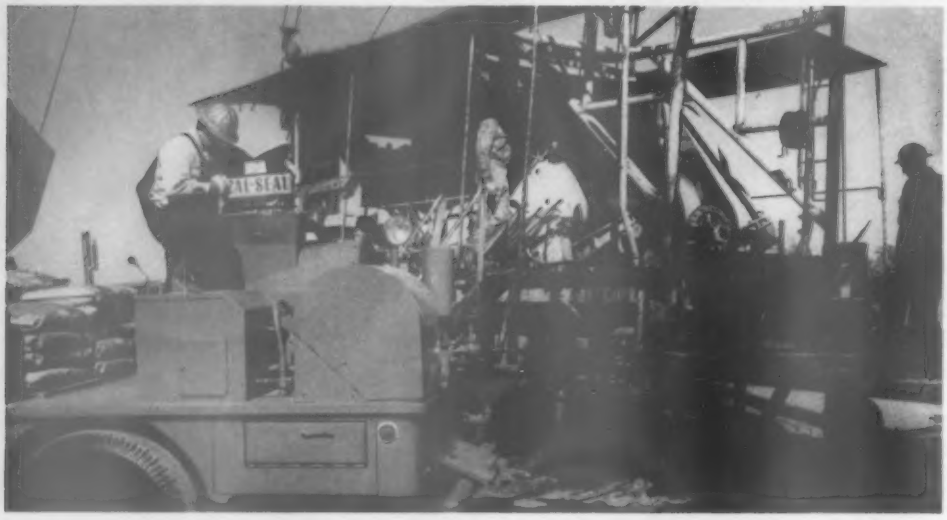
MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

Remedial Time-Saver

Cost of running in strings of drill pipe or tubing is saved when you have remedial cementing done by . . .

HALLIBURTON'S

dump bailer service



. . . because bailer containing cement is run in and out of hole on wire line . . . faster, more economically.

Wherever amount of cement needed is not too large and well is not too deep for bailer placement, save money by cementing with "no strings" of drill pipe or tubing. Call the world's most experienced Dump Bailer cementers.

This truck is one of the fleet of Halliburton Dump Bailer units. It carries all materials and equipment needed for Dump Bailer jobs such as . . .

- Nitroglycerine shot tamps
- Plug back jobs
- Bridge in pipe for repairs
- Water shutoff
- Securaloy removal
- Bridge for uphole treatments

HALLIBURTON

OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

These Halliburton Products Improve Dump Bailer Cementing...

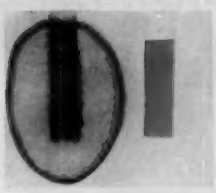
HALLIBURTON'S CAL-SEAL
EXPANDS AS IT SETS, MAKES TIGHTER PLUG

This quick-setting, super-strength gypsum cement is most popular for Dump Bailer jobs... bridge plugs, split pipe, blowouts, shot tamps. It expands 0.3% (linear) during setting which tightens plug in hole or fissure.

Cal-Seal develops a compressive strength of 2500 psi one hour after setting. The set product is readily drillable, low in permeability, easily applied and economical.

HALLIBURTON'S RESIN-CEMENT
FILTRATE PENETRATES FORMATION FOR TIGHT SEAL

Where oil production is hard to protect from fluid migration or water coning, Halliburton's Resin-Cement placed with Dump Bailer has successfully sealed troublesome formations in many wells. The fluid phase penetrates the formation, providing an impermeable seal and sets in continuity with the cement plug.



RESIN-CEMENT

HALLIBURTON HYDROMITE
A WATERPROOF PLASTIC CEMENT

Used extensively in remedial work as an overall tight non-permeable plug for plugging off bottom hole water in producing wells. Hydromite is a basic composition of a special gypsum cement and a powdered resin, and is especially adapted to Dump Bailer operations.

Hydromite has a controlled setting time from 75 to 100 minutes over a temperature range from 60°F. to 225°F. A compressive strength of 1500 psi is obtained within ten or fifteen minutes after initial set, permitting further dumping of material into the well almost immediately. Full compressive strength (approx. 4000 psi) is obtained in from 3 to 20 hours, depending on well temperature.

Can be placed in well by either Dump Bailer, or mixed through jet mixer in same manner as for squeeze operations.

HALLIBURTON'S "DB" BRIDGING BASKET
HELPS SPOT REMEDIAL CEMENTS WHERE WANTED

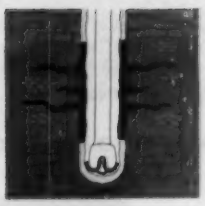
This useful tool aids remedial work off bottom of open hole or inside casing. Attached to Bailer section by special adapter, it is lowered to any depth in open hole or casing with a quick-setting material in the Bailer. A slight pickup of the Bailer sets and opens the Bridging Basket and dumps the material on top of the basket.

"DB" BRIDGING BASKET

HALLIBURTON HYDRO-LOK (PC-11)
PRODUCES A PERMANENT PLUG FOR EFFECTIVE SEAL

A plastic slurry consisting of a thermosetting resin and inert solids provides a squeeze material with fluid loss control. Hydro-Lok (PC-11) is either pumped by the Halliburton two-plug cementing method opposite the formation or placed by a Dump Bailer for various types of water control. Since water is an active catalyst for the resin, the setting of the resin when it is in place in a water formation is accelerated. PC-11 is adaptable for zones of high permeability, fractured sandstones and limestones... Low permeability formations can also be treated.

2 to 4 hours are required for a set in open hole. The resin phase which comes into contact with water in the formation sets in less than one hour and can be used in wells with temperature ranging from 60°F. to 240°F.



HYDRO-LOK (PC-11)

Dump Bailer Service

284 SERVICE CENTERS—JUST MINUTES AWAY FROM YOUR WELL

TWO NEW LOW-COST SYSTEMS IBM 1401 CARD... IBM 1401 TAPE

with stored program speed and ability

Never before has so much powerful data processing ability been built into such low-cost systems! For in these two new IBM 1401 Systems you get features previously found only in the larger data processing systems. With 1401 Systems fewer machine units do *more* jobs . . . at *higher* speeds . . . with *greater* accuracy and reliability . . . at *lower* job cost.

To assure you of more production per data processing dollar, IBM's concept of Balanced Data Processing gives you compatible input, processing and output speeds, backed by unequalled customer service. Drawing on all the experience gained in developing the world's largest and fastest computers, these low-cost 1401 Systems bring you these large computer features:

Solid State Design—and transistorized throughout to give you a compact system with greater accuracy and reliability. This powerful system involves no special construction . . . no air conditioning.

Stored Program—gives you the fully automatic processing of electronic systems. It is the key to simplified, economical operation. Completely flexible, a stored program permits you to switch easily from one type of job to another.

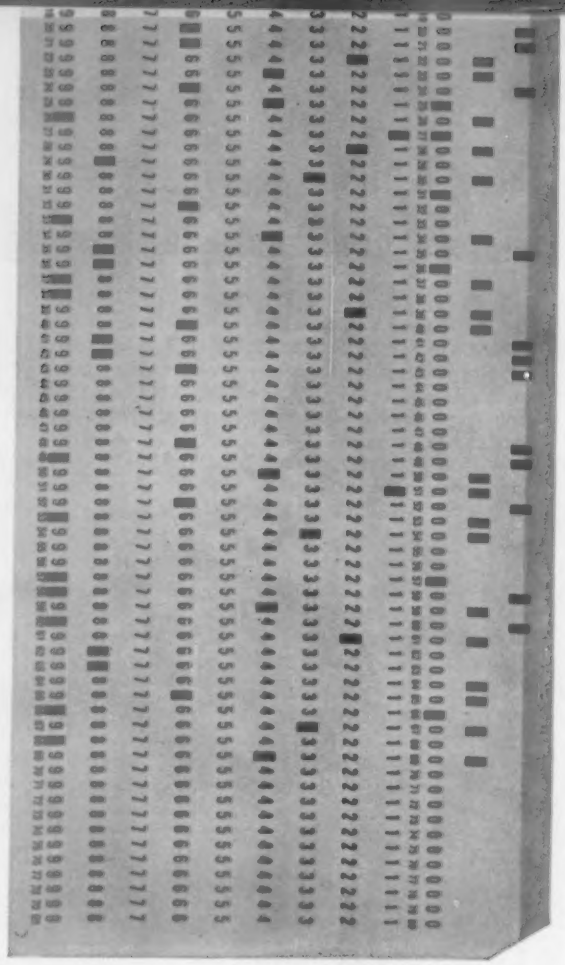
Magnetic Core Storage—the most powerful type storage available. To increase this power even further, the core memory of the 1401 accepts variable-length data and instructions, to permit the storage of only useful information. Choice of 1400, 2000, or 4000 positions of storage means you select the size storage to suit your needs.

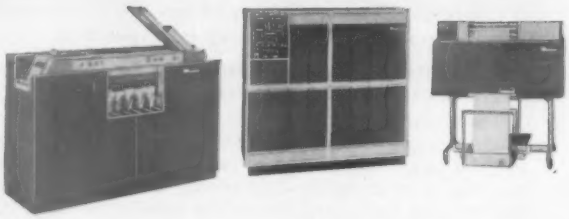
High-Speed Printing—these 1401 systems feature an exclusive new concept of printing. A horizontally rotating chain prints high-quality, perfectly aligned copy. A dual-speed carriage permits printing at the rate of 600 lines a minute, skipping blank paper at 27,000 lines per minute to produce more documents per dollar. Completely flexible editing and print format is provided by the central processor.

Your local IBM representative will explain the many applications and unusual features of the new 1401 Systems. Call him today. These systems, like all IBM data processing systems, may be purchased or leased.

BALANCED DATA PROCESSING

IBM





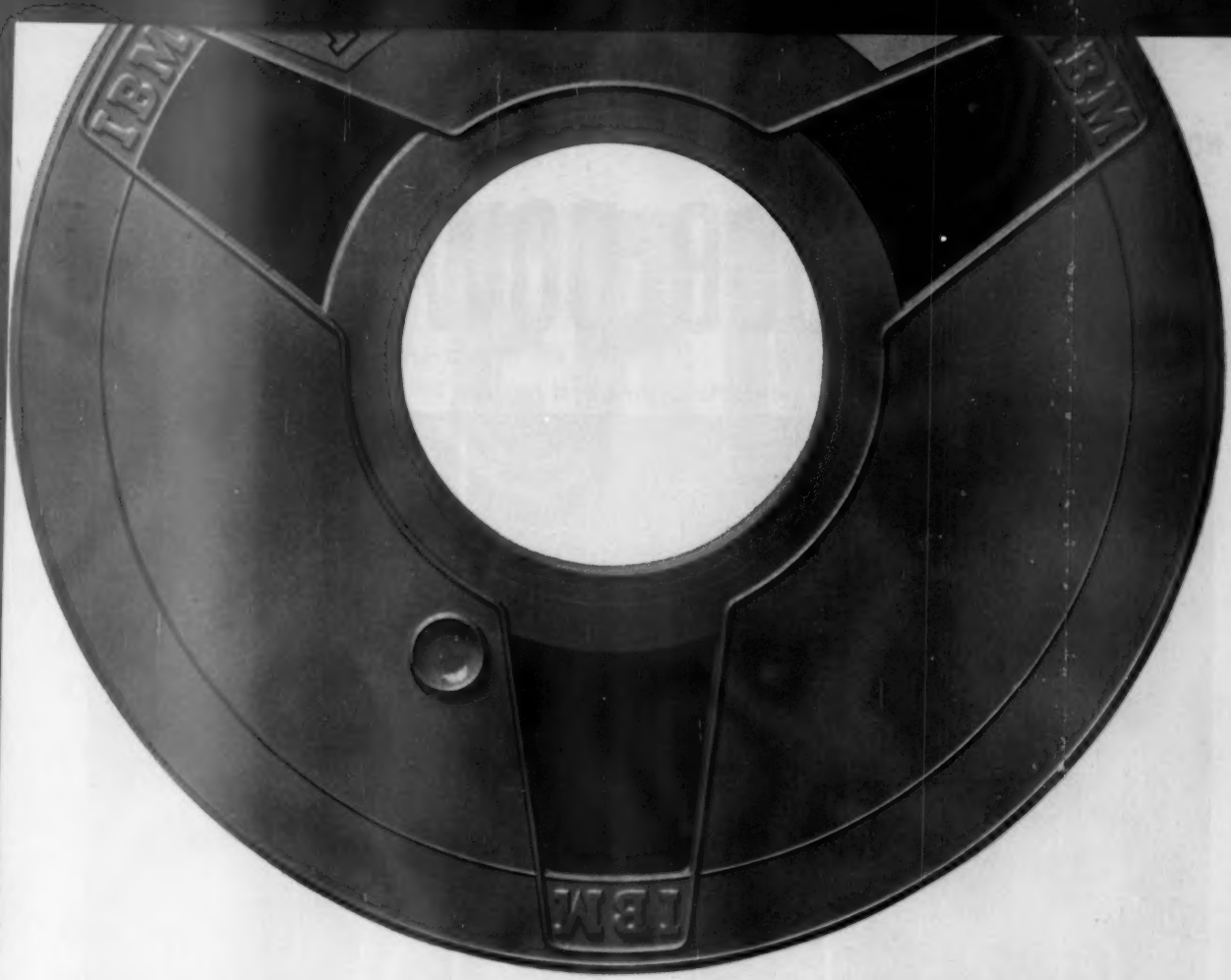
1401 CARD SYSTEMS

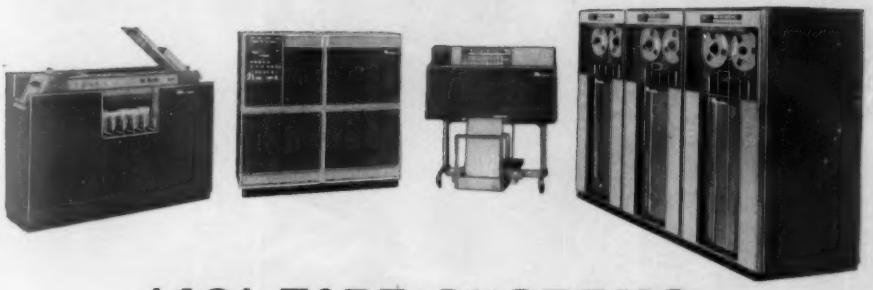
These stored program systems now bring the power of electronics to IBM card systems. They automatically handle the work of accounting machine, summary punch, and calculator, but at far greater speed, and with more flexibility and accuracy.

Input is faster—IBM cards are read into the system at the rate of 800 per minute. Data is processed automatically under stored-program control. Manual card handling is minimized.

Output is faster—documents are printed at the rate of 600 lines per minute, cards punched at 250 per minute. The system will turn out, for example, as many as 230 checks in one minute—again, more documents per dollar through Balanced Data Processing!

Thru-put is faster—data flow is automatically checked for accuracy and speeded all along the line. A unique Card Read-Punch combines card input, output, and summary punching functions. Five radial stackers accept cards that are selectively separated under stored program control.





1401 TAPE SYSTEMS

IBM 1401 Tape Systems give you added power through use of up to six magnetic tape units. These units feed data into the system at the rate of up to 62,500 characters per second . . . record processed results at this same peak speed.

1401 Tape Systems are also extremely valuable as off-line auxiliaries to large data processing systems. They can edit tapes prepared for larger IBM systems. They make possible a tape-oriented IBM 7070 configuration that provides higher speed input and output and makes for job cost improvement.

When tape units are added to 1401 Systems, you get greater flexibility and storage advantages, too. IBM tapes provide extremely compact storage of variable-length records—the equivalent of 129,000 IBM cards on a single reel. Tape records can be of variable length, and are read into and out of the system automatically. Also, tapes can be erased and re-used to minimize your record-keeping costs.

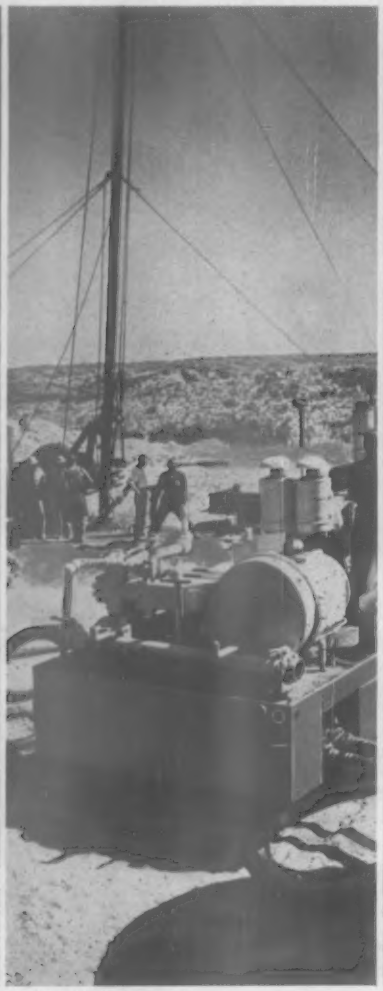
NOW YOU CAN STANDARDIZE WITH THE

all purpose power line

(20 TO 1650 H.P. IN ONLY 3 CYLINDER SIZES)

. . . and get all the benefits of GM Diesel standardization in any type of equipment built by over 250 leading manufacturers

Standardization with GM Diesel engines pays off big for oil men because fast-stepping, 2-cycle "Jimmy" Diesels power the finest equipment—get work done faster.



GM Diesel covers the power spectrum—20 to 1650 H.P. with only 3 cylinder sizes—compared to the 5 to 10 cylinder sizes which other Diesel manufacturers use.

Operators who standardize on GM Diesel power need stock, at most, only 3 sizes of wearing parts—maintain full protection with the smallest investment in spares.

GM DIESEL

PARTS AND SERVICE WORLDWIDE

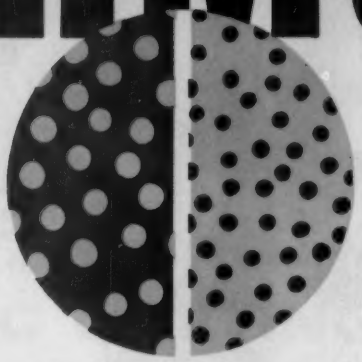
DETROIT DIESEL ENGINE DIVISION, GENERAL MOTORS, DETROIT 28, MICH

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

Seeing is believing . . .

INVERMUL*

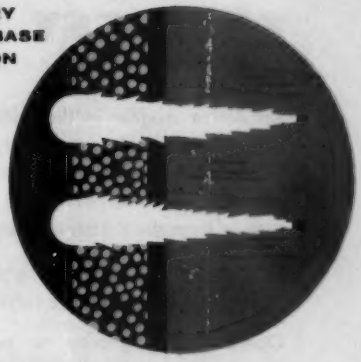
BAROID'S *basic additive for* **OIL-BASE-** *emulsion drilling muds*



INVERMUL OIL-BASE EMULSION | ORDINARY WATER-BASE EMULSION

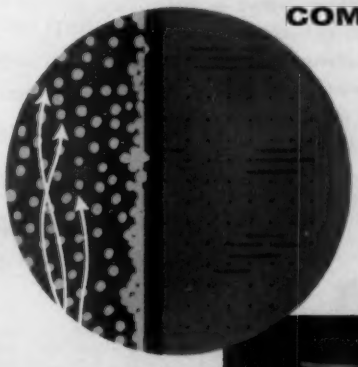
INVERMUL . . . stabilizes oil-base-emulsion mud prepared with crude or refined oils.

INVERMUL MUD . . . protects formations against water damage.



BETTER COMPLETIONS

INVERMUL MUD . . . is easy to maintain or recondition during drilling, coring or working-over.



WATER DAMAGE TO FORMATIONS MINIMIZED

BAROID

BAROID

BAROID DIVISION NATIONAL LEAD COMPANY

MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

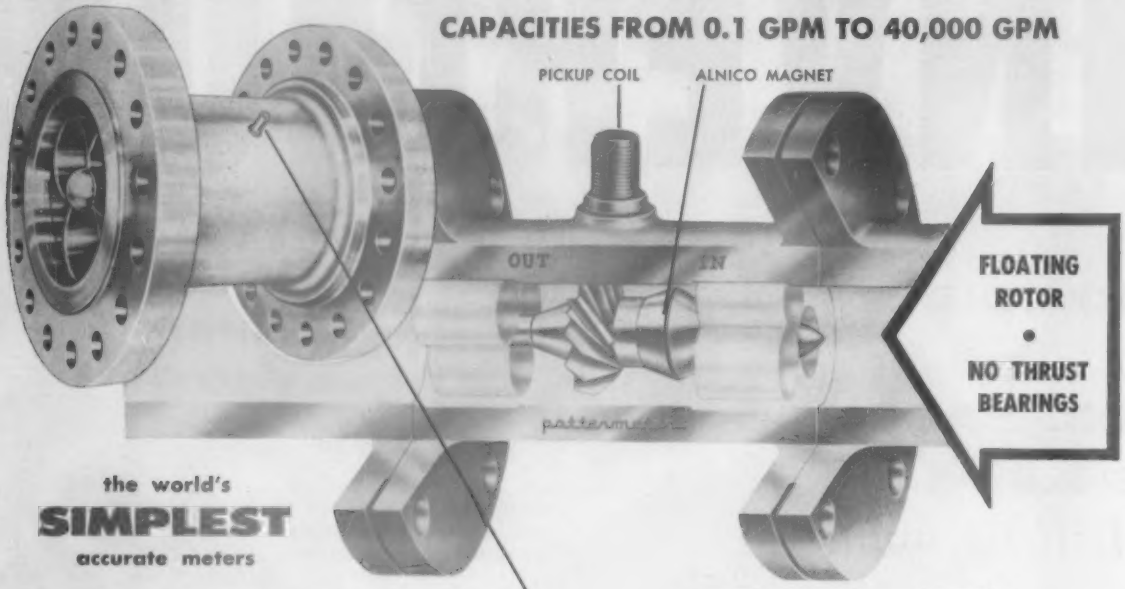
*Trademark of Baroid Division National Lead Co.

5913

pottermeter **BOWSER** ESTABLISHED 1885

INLINE ELECTRONIC TURBINE TYPE METERS

CAPACITIES FROM 0.1 GPM TO 40,000 GPM

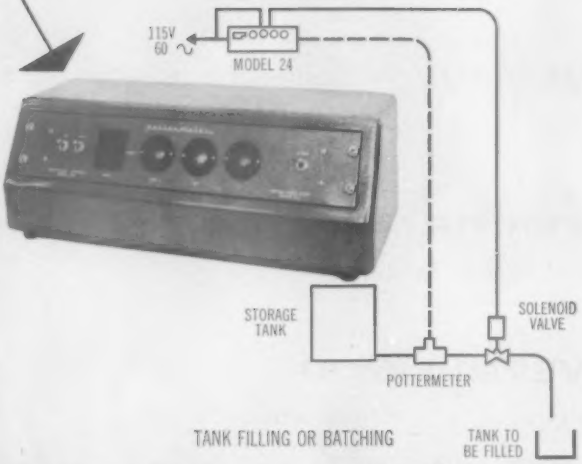


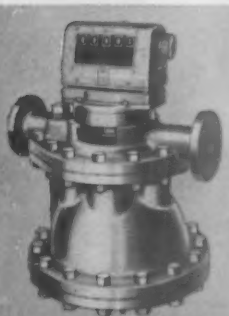
the world's
SIMPLEST
accurate meters

An Alnico magnet in the turbine rotor generates electric current directly proportional to the flow rate in the pipe. This activates readout or control equipment located at or remote from the Pottermeter unit.

PROVIDES BASIC INSTRUMENTATION FOR ANY AUTOMATION SYSTEM

Operating by gravity or pump pressure, Pottermeters are available in all pipe sizes. Electronic totalizers, recorders or controllers meet any need for automated liquid process or transfer operations. Potter-Bowser sales engineers in principal cities confer promptly with systems or plant engineers to detail availabilities and application data.



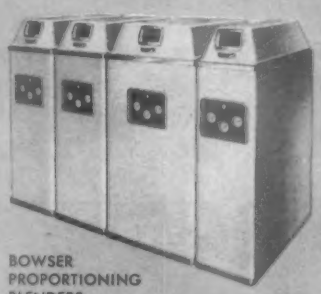


BOWSER XACTO METERS

BOWSER XACTO METERS AND PROPORTIONERS
positive-displacement piston type

Wherever mechanically driven readout and control equipment is indicated, and where positive-displacement metering is needed or costs less, Bowser Xacto Meters (leading all others in industry) are unexcelled for dependability and accuracy.
Capacities: 6 GPH to 250 GPM

Xacto Meter equipped proportioners are used to blend two or more liquids in continuous flow at accuracies to ¼ of 1 percent. First in lube oil blending, Bowser proportioners also handle most other liquids used by process industries.



BOWSER PROPORTIONING BLENDERS

Write For Catalog

Potter-Bowser Division **BOWSER, INC.** *Fort Wayne, Indiana*

from the makers of Dimetcote...

ZINKOTE®

THE FIRST 100% INORGANIC *SELF-CURING* ZINC COATING.

- A radically new concept in zinc coatings for protecting steel.
- Under development for many years and first patented in 1957.
- Applied in one coat – completely self-curing.
- Can be used wherever galvanizing is satisfactory – actually gives superior protection.
- Completely nonflammable, nontoxic.
- Insoluble in all petroleum products.
- Outstanding resistance to weathering, salt and fresh water.
- Applied by brush, spray or roller.
- Cathodically protects steel.
- Resists temperatures up to 600°F.
- Complete protection for as little as 5¢ per square foot material cost.

For complete information write ...

How does Zinkote compare with Dimetcote?
Although similar, each has certain unique advantages depending upon the particular requirements of the job. We will be glad to give you a specific recommendation.

Amercoat® CORPORATION

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The Pioneer Manufacturer of Inorganic Zinc Coatings

119

Outstanding performance

Shell Trickle Process

SHELL

t r i c k l e

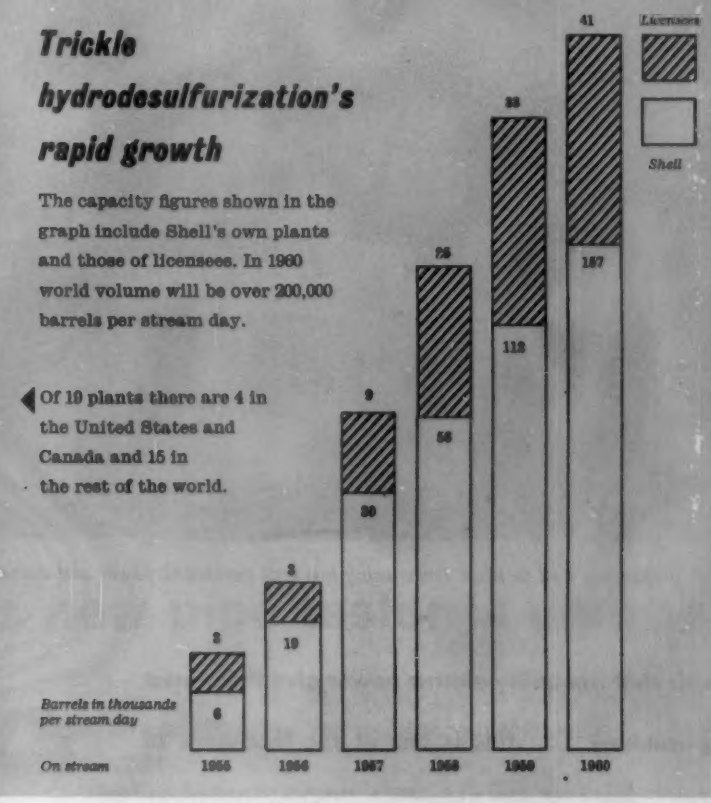
and economy with

Substantial economies in both capital and operating costs result from relatively low hydrogen recycle rates with only part of the charge vaporized. Sulfur elimination of 85–90% from middle distillates is readily achieved. The process provides notably long runs between infrequent catalyst regenerations to initial activity.
Although used commercially for the first time only in 1955, Shell's Trickle Hydrodesulfurization Process is now widely accepted in the industry.

Trickle hydrodesulfurization's rapid growth

The capacity figures shown in the graph include Shell's own plants and those of licensees. In 1960 world volume will be over 200,000 barrels per stream day.

◀ Of 19 plants there are 4 in the United States and Canada and 15 in the rest of the world.



hydrodesulfurization

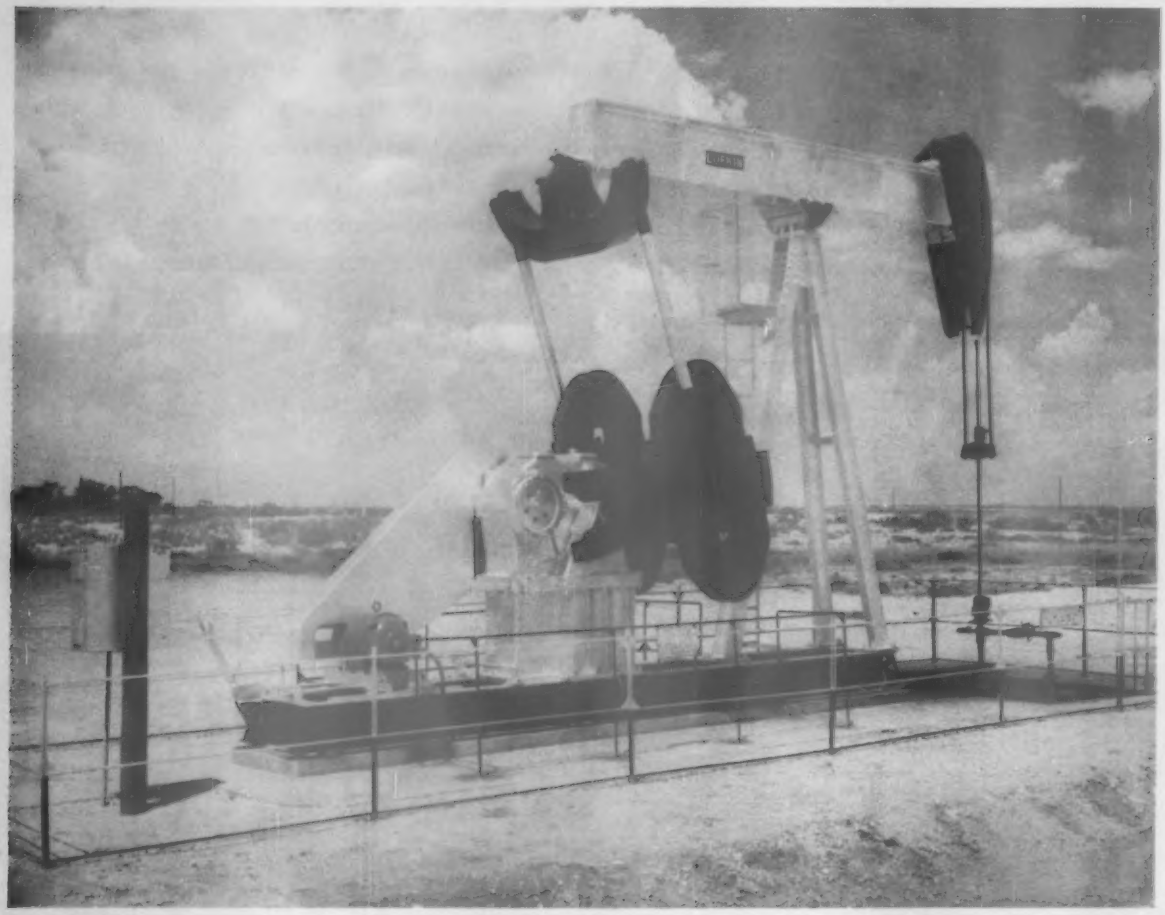
There is also available a Shell process for the vapor phase hydrodesulfurization of light fractions

Enquiries should be addressed:

For plant locations in U.S.A. and Canada to: Shell Development Company, 50 West 50th Street, New York 20, New York
Elsewhere to: Bataafse Internationale Petroleum Maatschappij N.V., 30 Carel van Bylandtlaan, The Hague, The Netherlands (P.O. Box 162)

You can depend on purchased electric power for

ECONOMICAL OPERATION



Producing well in West Texas using low cost purchased power and automatic control

Producing fields that use utility electric power give the utmost in operating economy . . . this is one of the thousands of wells producing as required with lowest possible operating cost. If you want more from your production, gathering, pipelines or refineries . . . use and *depend* on purchased electric power. Call your nearest utility electric power company for details.

Purchased Electric Power saves money, manpower, maintenance, and serves you better automatically

Petroleum Electric Power Association P. O. BOX 35006, DALLAS 35, TEXAS

New 15,000 psi tester includes automatic equipment for blowing out scale and dirt, stenciling, screwing on couplings, delivering pipe to tester, weighing after testing, screwing on thread protectors and spraying each length with oil.

SPANG's new pipe tester is unique

THE NATIONAL NSCO SUPPLY COMPANY

You can't produce the best quality tubular goods with ordinary facilities. So you obtain the best facilities available—even if, in some cases, the equipment is unique.

This new hydrostatic tester is such a facility. Added in our Ambridge, Pa. plant early this year, it's the only line production machine of its kind designed for a 15,000 psi pressure. It handles pipe up to 5½ in. O.D. and up to 48 ft. long, including plain end, threaded, coupled and upset pipe.

Modern facilities like this new tester insure the quality you always expect and get in Spang Tubular Products.

More on the next page—

STAIRS
STAIRS

Three points to remember when you buy drill pipe

1. A SPANG drilling string is a fully integrated string

National Supply is the only company in the industry manufacturing both the drill pipe and the tool joints. From this *single* responsible source, you get a string that has carefully controlled quality from start to finish.

2. SPANG leads in tool joint design—the critical area of pipe service life

Spangweld Tool Joints are welded to the drill pipe by an automatically controlled operation insuring accurate alignment and a high quality weld. The welding permits a streamlined contour and a reduced number of threaded elements. This tool joint connection also allows the smallest practical O.D. and maximum bore—a definite advantage for slim hole drilling.

Spang Double Seal Shrink Thread Tool Joints can be easily removed and replaced in the field. Joint design has an outer seal, threads and inner seal all on a single cone. This insures uniform, reliable installations both at the mill and in the field, and completely seals against internal and external pressures.

3. SPANG provides the best selective protection against corrosion and abrasion

Spang Plastic Coating—the result of ten years of research—gives the best protection against corrosion. Scientifically applied at the mill on specially-developed facilities, Spang Plastic Coating is available not only in Spang Drill Pipe but also Spang Casing, Tubing and Line Pipe.

Spang Hardfacing is a superior protection for tool joints in abrasive formations. It consists of multiple bands of tungsten carbide, *continuously* overlapped on the joint to form a solid particle-to-metal band.

Specific proof of these benefits is furnished every day in numerous locations throughout the world. The National representative in your area will be pleased to tell you more.

A National plant inspector checks the destination of an order of hardfaced Spangweld Drill Pipe. Spang Hardfacing consists of multiple bands of tungsten carbide, continuously overlapped on the joint to form a solid particle-to-metal band.

National Drill Collars on the next page . . .

National Drill Collars are simultaneously bored from both ends on this 165-ft. trepanning lathe designed especially for this purpose. The lathe's speed and accuracy obsolete the ordinary type of solid bar drilling.

Use precision-made National Collars for best penetration rates!

Are you looking for ways to improve penetration rates at all drilling speeds, and extend the life of your drill string? Specify National Drill Collars and you'll see new results because of these features:

High strength properties—National Collars are made from alloy steel, hardened and tempered *full length* (not just ends only) for high strength. As an additional safeguard against fatigue failure, National "Tuf-Flexes" its drill collar joints by cold-rolling or peening.

True center bores—These are established by a special 165-ft. trepanning lathe which precisely bores both ends of the collar simultaneously. All bores are carefully surveyed for concentricity to insure proper balance while rotating at normal and high drilling speeds.

Stress relief grooving—To improve the fatigue resistance of drill collar joints, National machines a stress relief groove at the last engaged thread zone of both box and pin members. The pin relief groove is designed to protect the shoulder corner as well as the stress concentrating zone at the last engaged thread.

Along with performace records, features like these are proof that you can't buy a better drill collar than National's. So get the best—and the operating benefits that go with it. See a National representative about the drill collar sizes to meet your needs. He can also give you some valuable tips on collar care and handling.

Replaceable End Collars

National also manufactures a complete line of drill collars with replaceable ends—incorporating a modification of the time-tested double seal shrink thread principle—for use in isolated areas where field shop facilities may not be available.

THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

DIVISION OFFICES: Calgary, Dallas, Denver, Houston, Toledo, Torrance, Tulsa

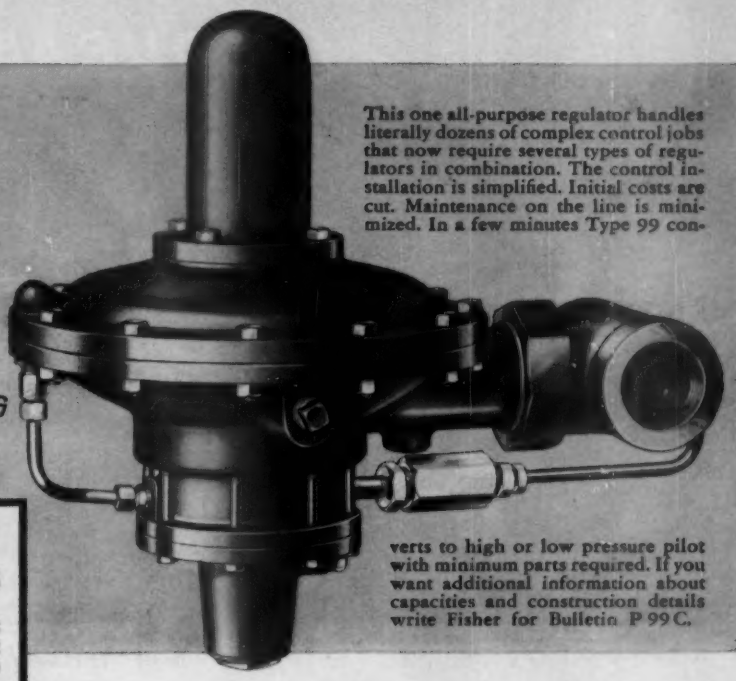
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E.C.1

Your *FISHER/MAN* offers you

a silent sentinel with hundreds of applications

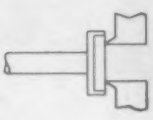
FISHER TYPE 99

MULTI-PURPOSE PRESSURE REDUCING GAS REGULATOR

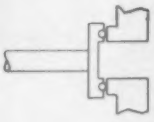


This one all-purpose regulator handles literally dozens of complex control jobs that now require several types of regulators in combination. The control installation is simplified. Initial costs are cut. Maintenance on the line is minimized. In a few minutes Type 99 converts to high or low pressure pilot with minimum parts required. If you want additional information about capacities and construction details write Fisher for Bulletin P 99C.

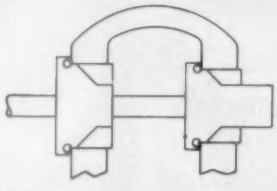
ORIFICE SIZES— INNER VALVE STYLES



⅜" Composition Disc Single Port. Max. Inlet 250 psi. 1⅛" Composition Disc Single Port. Max. Inlet 150 psi.

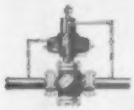


⅜" "O" Ring Single Port. Max. Differential 250 psi. 1⅛" "O" Ring Single Port. Max. Differential 250 psi. (with heavy main spring) 2" "O" Ring Single Port. Max. Differential 40 psi.



2" "O" Ring Double Port. Max. Differential 100 psi.

1. **The factory pre-set spring provides powerful lock-off action.**
2. **Large, effective area of main diaphragm in combination with relay pilot assures trouble-free accuracy.**
3. **It is only a matter of minutes and a minimum of parts to convert to high or low pressure pilot.**
4. **2" threaded or flanged inlet and outlet. Standard hi-tensile iron body for up to 150 PSI inlet, XH or bronze body for up to 250 PSI inlet.**
5. **Composition valve disc assures tight shutoff on zero flow and excellent regulation from low flow to maximum capacity.**



IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY . .

FISHER GOVERNOR COMPANY

Marshalltown, Iowa / Woodstock, Ontario / London, England

CONTINENTAL EQUIPMENT CO. DIVISION, Coraopolis, Pennsylvania

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SINCE 1880

Men who know pipe point to WHEATLAND for DURABILITY!

INSIST ON PIPE MADE IN U.S.A.

Steel pipe that lasts and lasts—Wheatland Steel Pipe—is singled out by more *knowing* men every day. They *know*, too, that the "pipe with the yearmark" is consistently superior in quality, relatively low in cost and easy-working on any application. Every length is backed by Wheatland's sincere desire for complete customer satisfaction. Next time, point to Wheatland!

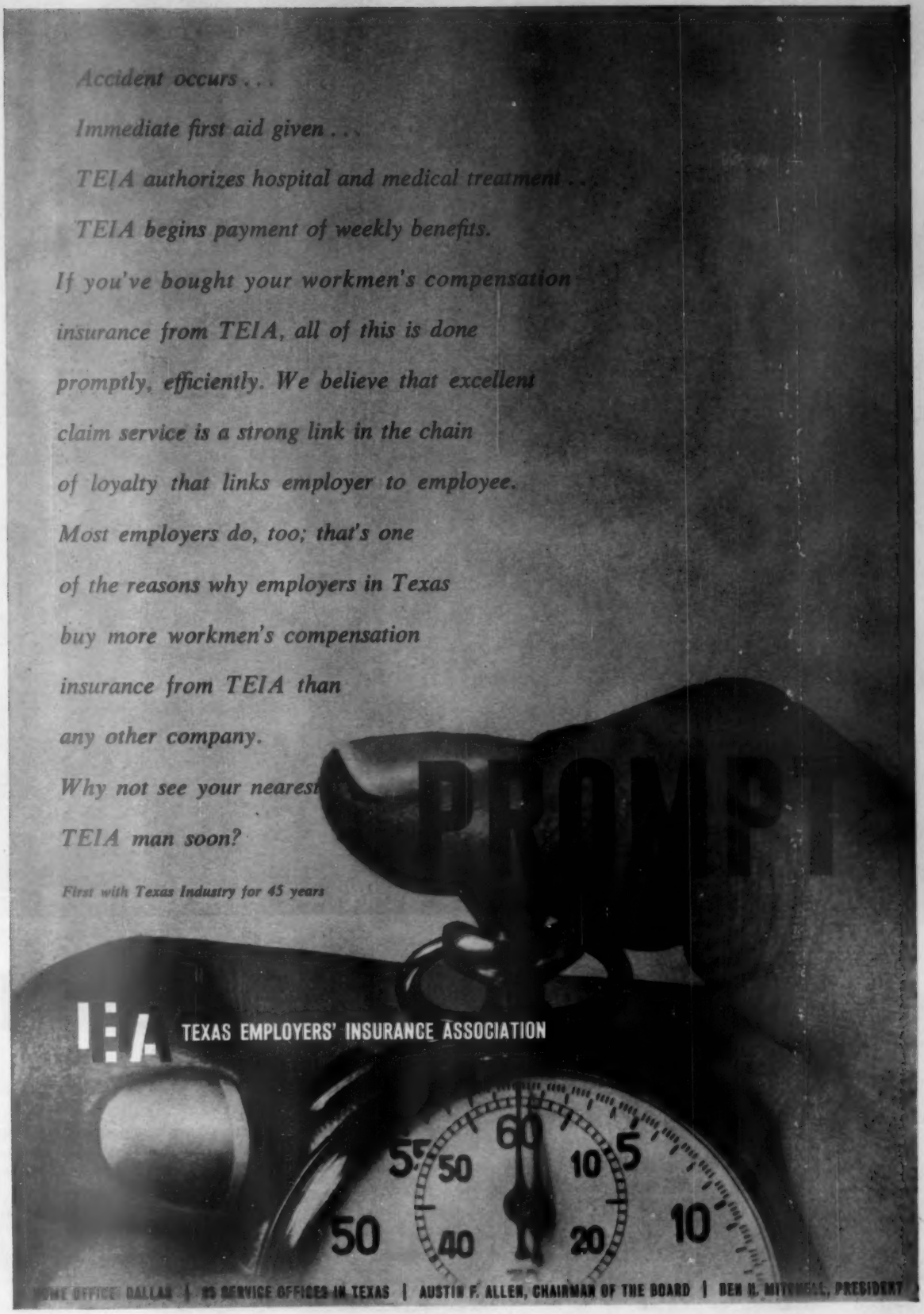
...pipe with the yearmark!

API LINE PIPE IN ACCORDANCE WITH AMERICAN PETROLEUM INSTITUTE SPECIFICATIONS

For Black or Galvanized Pipe, contact your distributor or

WHEATLAND TUBE CO.

BANKERS SECURITIES BUILDING, PHILA. 7, PA. • MILLS: WHEATLAND, PA. • DELAIR, N. J.


Accident occurs . . .
Immediate first aid given . . .
TEIA authorizes hospital and medical treatment . . .
TEIA begins payment of weekly benefits.
If you've bought your workmen's compensation
insurance from TEIA, all of this is done
promptly, efficiently. We believe that excellent
claim service is a strong link in the chain
of loyalty that links employer to employee.
Most employers do, too; that's one
of the reasons why employers in Texas
buy more workmen's compensation
insurance from TEIA than
any other company.
Why not see your nearest
TEIA man soon?
First with Texas Industry for 45 years
PROMPT
TEXAS EMPLOYERS' INSURANCE ASSOCIATION
HOME OFFICE: DALLAS | 25 SERVICE OFFICES IN TEXAS | AUSTIN F. ALLEN, CHAIRMAN OF THE BOARD | BEN H. MITCHELL, PRESIDENT

ENGINE SPECIALISTS— Milt Walker, Al Busch and Frank Carter—will visit every Worthington engine compressor pipeline installation once every six months. Shown on the map are the major natural gas pipelines.

VISIT EVERY PIPELINE ENGINE

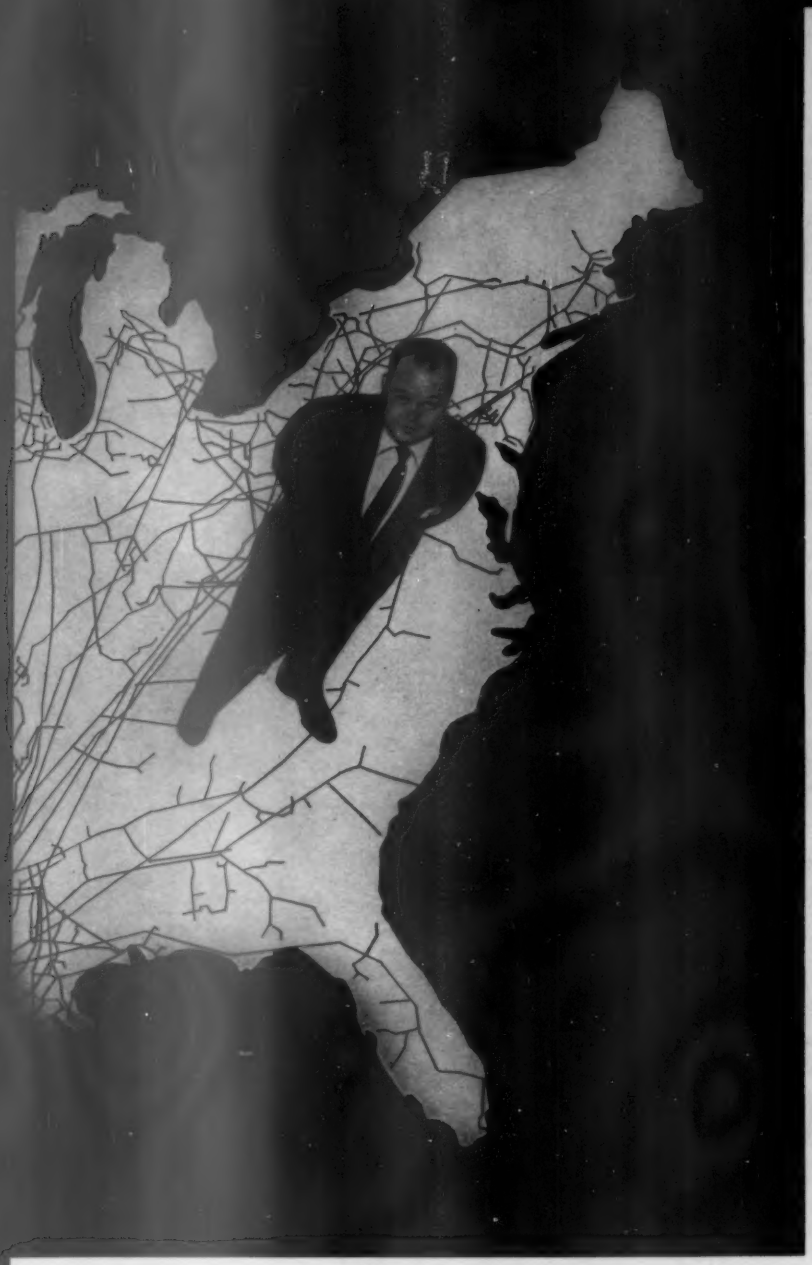
That's the schedule of Worthington's new missionary organization for pipeline engine compressors

Worthington has had a missionary program for engines and engine compressors for many years.

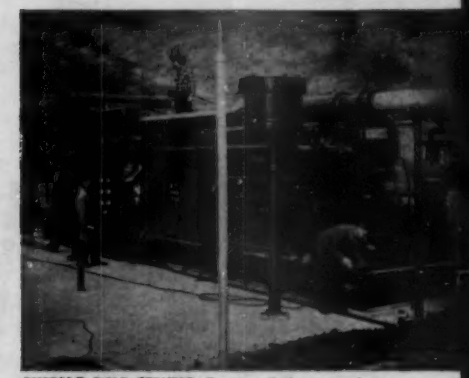
In order to give special attention to vital pipeline installations, however, Worthington now has a program for visiting every pipeline engine compressor at least once every six months.

Three key Worthington engine compressor specialists, Milt Walker, Al Busch and Frank Carter, have been assigned to this important project. In their visits they will . . .

1. **Assist operators** in all phases of engine compressor operation and maintenance.
2. **Observe practices** in current use at each installation.
3. **Set up or modernize procedures,** based on the latest methods and practices.
4. **Submit reports** to pipeline companies giving station-by-station commentary



REGIONAL ENGINEERING & SERVICE. For routine service or emergency help, Worthington R. E. & S. personnel are available on a moment's notice.



BUFFALO FIELD SERVICE. For installation or major repairs, Worthington maintains a cadre of experienced engine personnel in Buffalo.

REGIONAL PARTS SERVICE. Large stocks of pipeline engine parts are maintained in Buffalo, Houston, Los Angeles, Calgary and Colombia, South America.

NEW SERVICE MINDED SALES ORGANIZATION. Sales and service are now combined in an organization that is more responsive to your service needs.

EVERY 6 MONTHS!

about the practices observed plus specific suggestions for future consideration.

This Worthington service is another progressive step taken by a service-minded company. Other steps include (1) Regional Engineering and Service—nearby, quickly available help on a decentralized basis, (2) Factory Field Service—a centralized pool of engine compressor specialists for installation and for major service problems, and (3) Regional Parts Service—depots of engine compressor parts are maintained in Buffalo, Houston, Los Angeles, and Calgary in North America, and in Colombia, South America. Worthington Corporation, Harrison, N. J. In Canada: Worthington (Canada) Ltd., Brantford, Ontario. 43-5

WORTHINGTON

NOW A CRESCENT FLANGE TREE

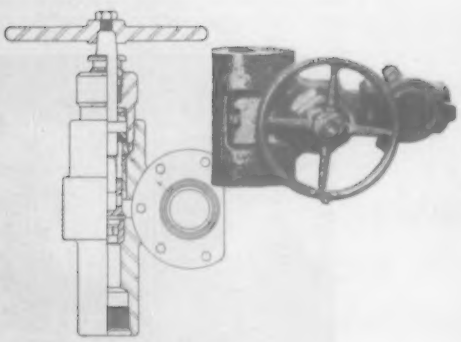
with the time-proven J-E flow control

The O-C-T Crescent Flange Tree offers unmatched flexibility, simplicity and economy in that one valve in the dual hookup can be removed without disturbing the other.

Now, O-C-T offers the CRESCENT FLOW CONTROL. It features all advantages of the **time-proven J-E Flow Control** AND has individual crescent flanges for dual trees.

Thus, the Crescent Flange Tree has new compactness and economy. Further elimination of connections guarantees leak-proof operation.

If there is a dual in your future, you will profit by talking to an O-C-T representative.



where progress is a daily practice

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OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to
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Photographed at Gulf Refinery, Philadelphia, Pa.

THE GOLDEN RULE THAT PRODUCES RESULTS...

Our golden rule is teamwork between refiners and Cyanamid. As a result of this teamwork, Cyanamid produced the first fully regenerative platinum reforming catalyst and helped develop the first micro-spheroidal synthetic fluid cracking catalyst. Continued co-operation between refiners and Cyanamid is sure to produce further advances in catalytic refining techniques.

Symbolizing this co-operation is Cyanamid's salesman–the man with the golden rule. You can depend on him at all times for help in meeting the operating problems caused by demands for ever-improved fuels. His personal knowledge is backed by the research and production facilities of one of the world's leading producers of catalysts. Call him anytime he can be of help to you . . .

Basic in catalyst chemistry CYANAMID

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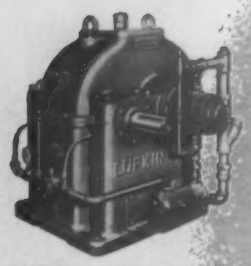
A Name SYNONYMOUS with Quality

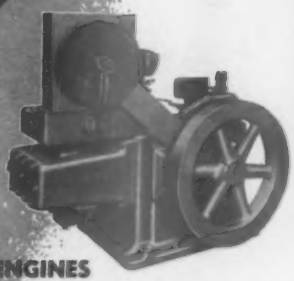
PUMPING UNITS

GEARS

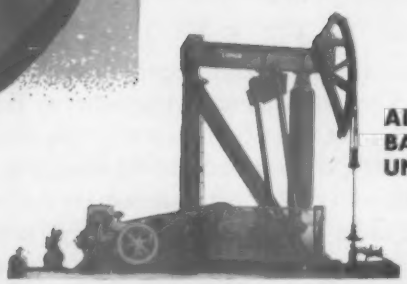
LUFKIN



SPEED REDUCERS AND INCREASERS



GAS ENGINES



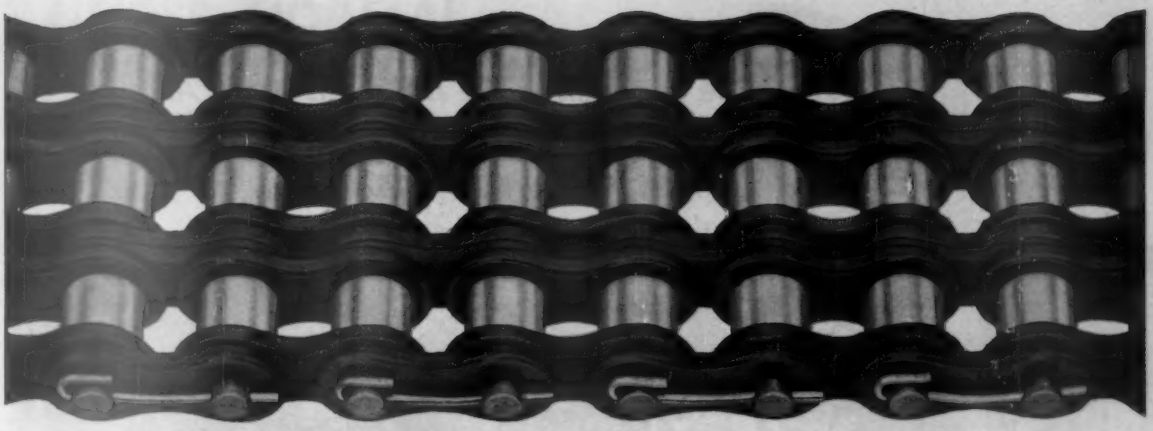
AIR BALANCED UNITS

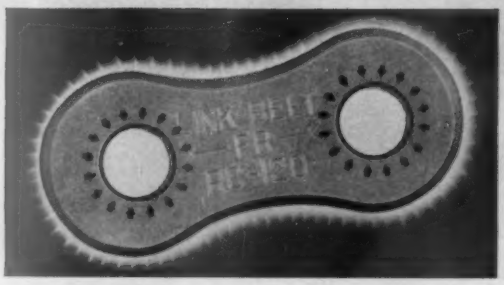
LUFKIN FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

Branch Sales and Service HOUSTON • NATCHEZ • CORPUS CHRISTI • LAFAYETTE • DALLAS • KILGORE • ODESSA • HOBBS • GREAT BEND • DENVER SHREVEPORT • WICHITA FALLS • LOS ANGELES • BAKERSFIELD • EFFINGHAM • CASPER • OKLAHOMA CITY • SIDNEY • MIDLAND FARMINGTON • SEMINOLE • TULSA • NEW YORK • PAMPA • STERLING • MARACAIBO, VENEZUELA • ANACO, VENEZUELA

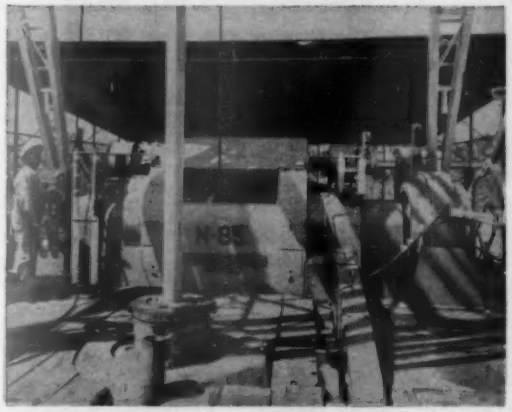
Lufkin equipment in Canada is handled by THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada





Arrows indicate critical areas treated with compressive stresses to improve fatigue resistance.

Fortified against fatigue



BREWSTER N-85 DRAWWORKS is equipped with Link-Belt multiple-strand precision steel roller chain with "FR."

LINK-BELT FR® oil field roller chain stands up to tremendous stresses of modern drilling service

The smashing impacts and tortuous stresses met in day-to-day drilling are taken in stride by Link-Belt FR (Fatigue Resistant) roller chain. Through its patented FR process, Link-Belt gives its roller chain *greater dynamic strength*. FR greatly raises the chain's endurance limit by compressing metal around pitch holes—the critical sidebar areas most vulnerable to fatigue failure.

The FR process results from the same design and metallurgical research that has produced many more "extras," all *standard* in Link-Belt oil field roller chains. They include shot-peened rollers, close heat-treat control, Shepherd's Crook Cotters and others. For details, see Catalog 2880.

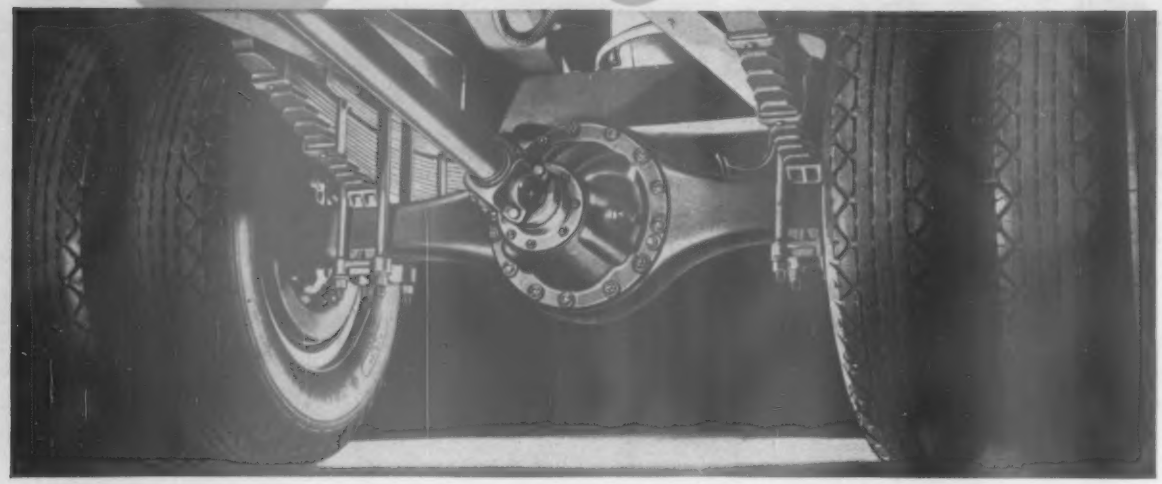
LINK-BELT

ROLLER CHAINS AND SPROCKETS

CATALOG 2880 has full information on all Link-Belt oil field equipment. You can obtain a copy from any leading supply store in the field. Also in Composite Catalog of Oil Field Equipment.

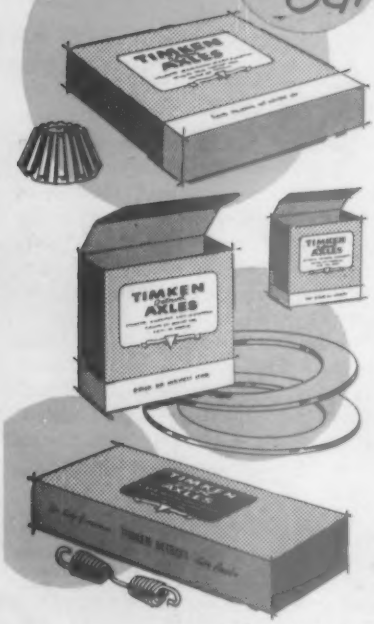
LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 6, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

The superiority of a Timken-Detroit® Axle depends on the quality of all its parts...



Only genuine Timken-Detroit® Replacement Parts

can keep it as good as new!



You bought the best—replace with the best! Every genuine Timken-Detroit Axle replacement part is built to the same high quality standards as original Timken-Detroit parts. By using only genuine Timken-Detroit replacements, you can be sure of retaining the high quality and performance advantages you bought when your axle was new.

Because they are manufactured to the same rigid engineering specifications as the original equipment and carry the same manufacturer's guarantee, Timken-Detroit replacement parts save you time, money and trouble. Extra machining or fitting operations are eliminated. Labor and adjustment costs are cut to a minimum. Parts take less time to install.

Many Timken-Detroit replacement parts are packaged in convenient kits containing all the related components you need to do a "factory-type" job. These kits assure maximum protection so that every parts package you receive arrives in perfect condition.

See your factory authorized vehicle dealer for all your replacement needs. Only he can supply the parts that will *keep* your Timken-Detroit Axles as good as new.

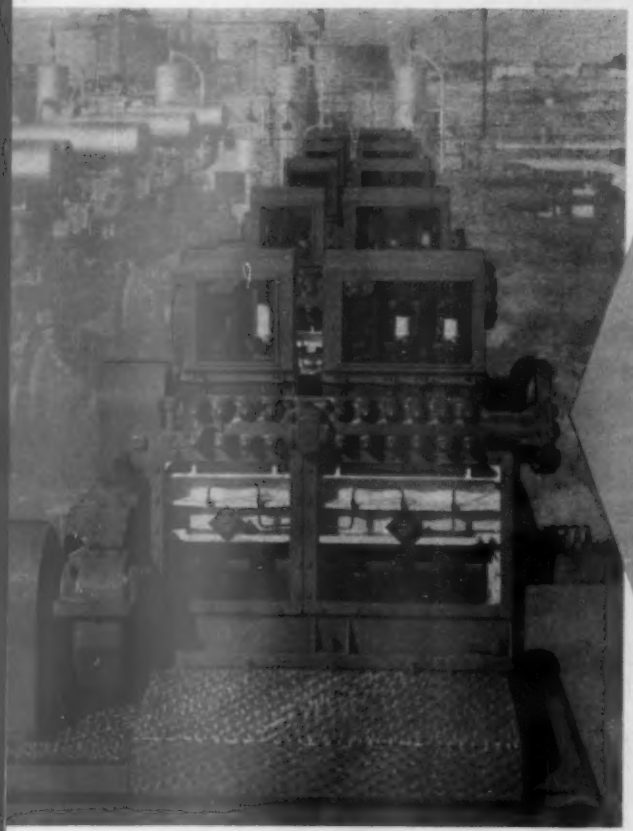
Products of

ROCKWELL-STANDARD CORPORATION

Transmission and Axle Division, Detroit 32, Michigan

UNDER NORMAL CONDITIONS . . .

Any Good Pump will do the Waterflood Job



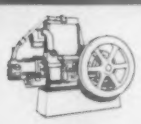
"Five Ajax Quintuplex pumps on Long Beach project."

. . . but Ajax builds in anticipation of troublesome suction conditions—water hammer—excessive loads—high stress, fatigue causing conditions . . .

Thus an Ajax pump reduces down time and increases "ON THE LINE" pumping time.

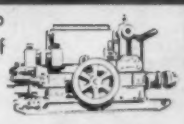
- Streamlined discharge manifold — reduces turbulence
- Double row tapered permanently factory adjusted roller main bearings result in lowered maintenance cost.
- "Safety Link" Tie Rods — protect vital components during highly abnormal conditions

AJAX OIL FIELD PUMPS



ENGINES

AJAX also builders of

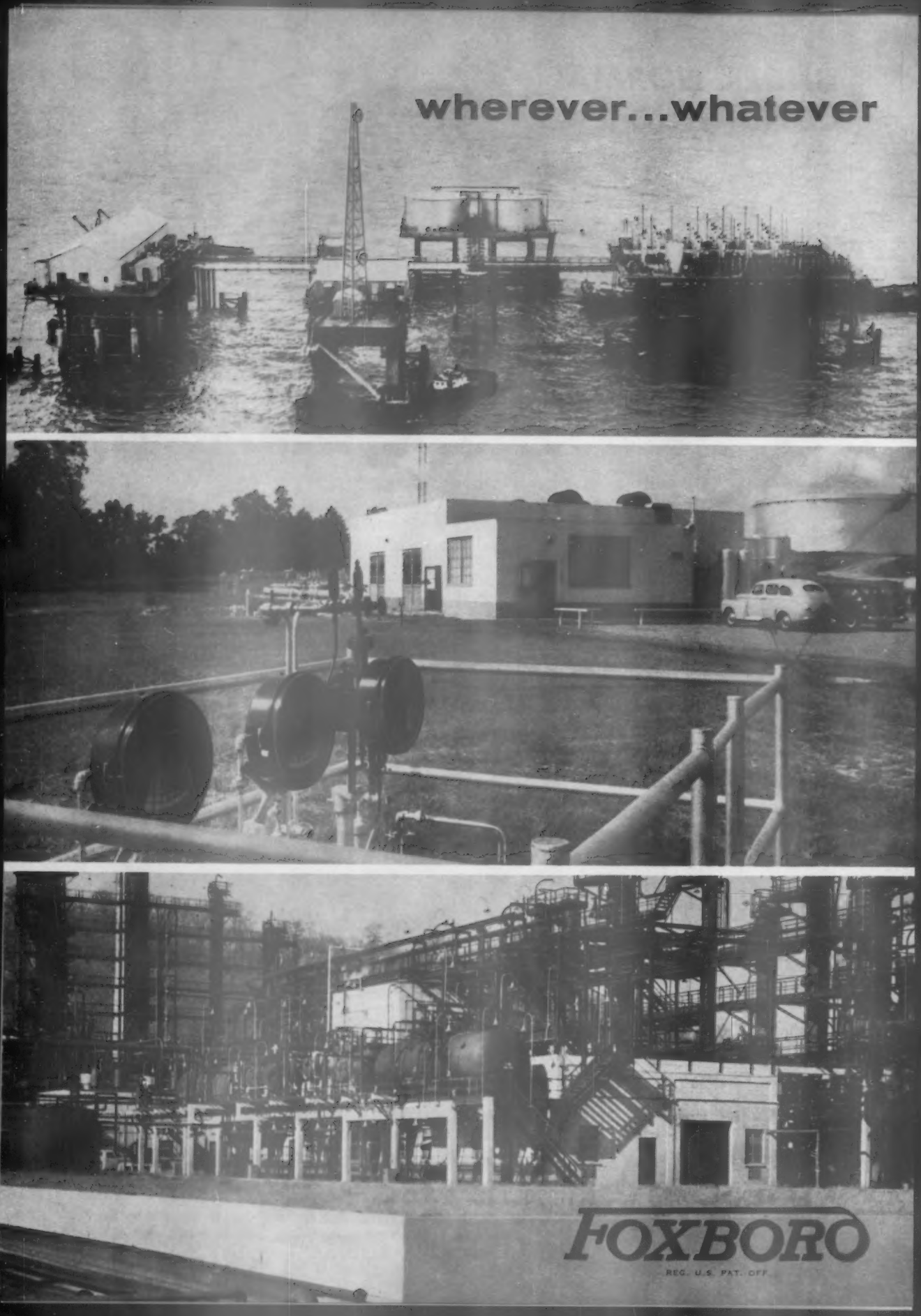


COMPRESSORS

AJAX IRON WORKS CORRY, PENNSYLVANIA

OIL FIELD DISTRIBUTORS: The National Supply Co., Pittsburgh, Pa.

- Bethlehem Steel Company, Supply Division, Tulsa, Oklahoma


wherever...whatever
FOXBORO
REG. U.S. PAT. OFF.

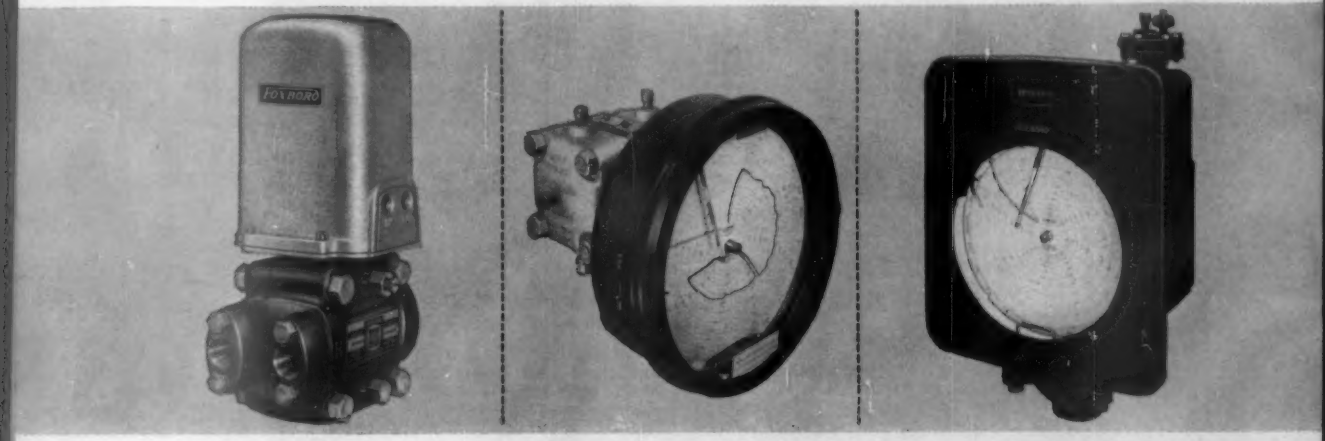
your flow problem

FOXBORO HAS A BETTER INSTRUMENT FOR IT

Liquid, vapor, gas, or slurry—there's a Foxboro instrument to meter the flow of any fluid in any oil and gas process. From the simplest general utility meter, to complex automatic ratio control systems, Foxboro offers the greatest variety of flow measurement and control equipment, assuring you of the right instrument for every flow problem.

Foxboro meters include superior accuracy, "cashregister" flow recorders; portable types for field checking; transmitters for long-distance, centralized control; as well as specially designed flow systems for even the most unusual needs.

A few of these meters are described below. For complete information on these, or any meter in Foxboro's complete line of flow instrumentation, get in touch with your nearby Foxboro Field Engineer. Or write **The Foxboro Company, 6011 Neponset Ave., Foxboro, Mass.**



d/p CELL FLOW TRANSMITTER. Provides high sustained accuracy with positive overrange protection—complete line includes both pneumatic and tubeless electronic transmitters.

DIAPHRAGM METER. Uses no mercury—inherently linear, with NO zero drift. Round and rectangular cases. Available also as pneumatic or tubeless electronic transmitter.

MERCURY METER. Wide variety of types. Type 28 Meter, shown above, is ideal for gas flow metering. It has the longest float travel and the most power of any commercial meter made.

OTHER FOXBORO FLOW INSTRUMENTATION: Magnetic Flow Meters • Panel-, field-, and valve-mounted flow controllers • Electric, Pneumatic, and Mechanical Integrators • Planimeters • All primary elements, valves, and accessories required for complete flow measurement and control systems.

FIRST IN *FLOW*

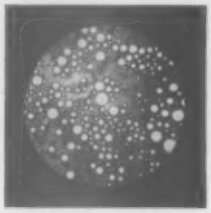
another
TRETOLITE SERVICE
report

TRETOLITE FIRST

WITH FOUR MONEY-SAVING AIDS TO PRODUCERS

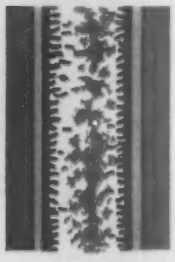
The following four production aids have been field-proved by billions of barrels of treated crude—and have saved producers literally billions of dollars over the years.

1. TRET-O-LITE*
Demulsifiers



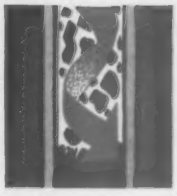
The first chemical demulsifier used in the petroleum industry for the recovery of emulsified crude oil was invented by William S. Barnickel, founder of the Tretolite Company. Since then, TRET-O-LITE demulsifiers have rendered useful millions of barrels of crude oil that might otherwise have been lost. Today, many TRET-O-LITE formulas are available not only for the recovery of emulsified production, but also for salt removal from crude oil, and useful- oil salvage from tank bottoms and slop oil systems.

2. KONTOL*
Organic Corrosion Inhibitors



Tretolite Company research and field engineering developed the first organic corrosion inhibitors specifically for petroleum equipment and pioneered their first application. Today, KONTOL Corrosion Inhibitors are used in the production (as well as refinery and pipeline) departments of leading oil companies everywhere.

3. SOLVO*
Paraffin Removers



Paraffin removers which contain neither carbon bisulfide nor organic chlorinated solvents were first introduced by Tretolite. The harmful effects of chlorides in crude oils on certain refining catalysts have made clear the need for such chloride-free paraffin removers.

4. FLUDEX*
Multi-purpose Water Flood Additives

Another Tretolite "first", this series of products combines the features of organic corrosion inhibitors, bactericides, scale preventives and wetting agents. Widely used in water-flood operations, FLUDEX additives increase injectivity, and at the same time, mitigate problems arising from corrosion, bacteria and scale. They are also being effectively applied for backwashing water-flood filters, water clarification, and stimulating production in stripper wells.

Because Tretolite has developed and pioneered the application of these products, this organization can offer you a brand of experience and service in the manufacture, use and know-how of these products that's unequalled anywhere else in the industry.

For further information on how these and other money-saving Tretolite aids can fit into *your* operation, *ask the Man in the Red Car*—your own Tretolite Field Service Engineer.

*TRET-O-LITE, KONTOL, SOLVO and FLUDEX *are registered trade-marks of Petrolite Corporation.*

TF59-1

PETROLITE
CORPORATION

TRETOLITE COMPANY
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VENEZUELA: South American Petrolite Corporation, Hotel Avila, Caracas

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new..

"Varec" Dynamatic

HIGH ACCURACY AT LOW COST

Power Operated

liquid level

TANK GAUGE

- Accurate to better than 1/16".
- Readings in feet inches and sixteenths.
- Graduations available in metric and decimal.
- No floats, counterweights or spring balances.
- Large, easy to read numbers on dial and counter.

The *Dynamatic* Power Operated Gauge utilizes a force balance system arranged to detect and display liquid level. The measuring device consists of two elements; a force measuring element and a displacer that is a solid plate of any material suitable to the environmental conditions.

Friction—the specific gravity of the product— the load placed on the gauge head to drive accessory controls and remotes—turbulence—none of these have any adverse effect on the accuracy or reliability of the gauge.

The remarkable low cost and the high level of accuracy and sensitivity have been achieved by Varec's uniqueness of design and not by the sacrifice of quality materials and workmanship. ● *Request Bulletin CP-3705* ●

The Vapor Recovery Systems Company - Compton, Calif.

DX Sunray upgrades product quality, boosts motor fuel production capacity, with five new UOP process units

by Harry A. Brown
Vice President of Manufacturing
DX Sunray Oil Company,
Tulsa, Oklahoma

(Above) This view of Platformer LPG recovery section shows deethanizer (left) and depropanizer tower (center). Third tower (right) is Unifining Unit's stripper column.

New Platforming® unit boosts production of high-octane gasoline nearly 200%

In little more than three years after becoming the refining and marketing subsidiary of Sunray Mid-Continent Oil Co., DX Sunray Oil Co. launched a major modernization program.

Harry A. Brown

In early 1959 we placed on stream at our West Tulsa refinery a 20,000 BPSD Unifining* unit, a 12,000 BPSD Platforming unit, a 2,400 BPSD Isomerization Unit and a 2,500 BPSD HF Alkylation unit. At about the same time we added at our Duncan, Oklahoma, refinery a 6,000 BPSD Unifining* unit to an existing layout which already included a 6,000 BPSD Platforming® unit, a 22,000 BPSD Fluid Catalytic Cracking unit, a 3,500 BPSD HF Alkylation unit and a 750 BPSD Catalytic Condensation unit. Installed at a cost of $12 million, and designed and engineered by Universal Oil Products Company, our new units are the most modern available and were installed to carry out our avowed objective of marketing high-quality products.

Triples high-octane output

The four UOP units provide more high-octane gasoline than the Tulsa refinery previously manufactured. The new Platformer almost triples the output of high octane gasoline there, and addition of the new HF Alkylation unit more than doubles DX Sunray's potential for producing 105-octane gasoline.

*Trademark

Being charged to the new Unifining unit is a blend of straight-run and coker naphthas for preparation as feed stock to two Platformers. These include a 7,500 BPSD reforming unit that was converted to UOP Platforming in June of 1956 and the new 12,000 BPSD unit completed this year. At relatively low cost, Unifining desulfurizes and purifies the Platforming feed stock and transforms olefins into paraffins. Combined operation with Platforming provides a most economical source for the hydrogen required in Unifining.

LPG unit recovers butane, propane

At the new Platforming unit, the Unifined, depentanized C_6-plus naphtha, or feed stock, is heated and contacted with a specially prepared platinum-containing catalyst under operating conditions to produce a C_5-plus gasoline with a leaded octane number as high as 99, if required. A rerun tower is provided for preparation of selected blending stocks. In conjunction with the Platformer there is an LPG unit designed to recover 92% butane and 60% propane.

In conjunction with the decision to modernize the Tulsa refinery, we gave careful consideration to future demands for higher-octane gasoline. Expanded facilities for alkylation, to produce motor alkylate as a blending component, were chosen since sufficient quantities of butane available in our refinery streams could be isomerized and, as isobutane, utilized as one of the feed stocks for HF Alkylation. Universal engineers, therefore, designed a 2,400 BPSD Butane Isomerization unit to service the HF Alkylation facility. The two processes are controlled and operated as a single unit.

Could produce 105-plus leaded octane

The HF Alkylation unit product is 2,500 BPSD of 105-octane gasoline blending stock. Actually, the unit would permit the Tulsa plant to turn out gasoline exceeding the 105 octane number (leaded) if market conditions should so dictate. However, DX Sunray has no immediate plans for producing motor fuels in such super ranges. If and when the need for higher-octane gasoline arises, we're ready for several years to come. Meanwhile, much of this high-octane alkylate is used to manufacture aviation gasoline. The remainder is blended with other refinery stock to produce a premium gasoline which is equal or superior in quality to any in the DX marketing area.

Combination HF Alkylation— Butane Isomerization unit assures potential production of super-octane gasoline

View of DX Sunray's isomerization unit showing three reactors at left. Second tallest tower (center) is the debutanizer column. Deisobutanizer (right) is the highest refinery tower in Oklahoma.

UOP® UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.
More Than Forty Years Of Leadership In Petroleum Refining Technology

In speed increasers . . . look for

resistance to vibration and impact stresses

Here's why you'll find it when you come to **FARREL**

The problems involved in designing high-speed gearing are quite different from those encountered in ordinary industrial transmissions. Questions of vibration and impact stresses, for example, increase in importance as the speed goes up.

How the design of Farrel SI units has been tailored with these problems in mind, is described briefly at the right. For further details, send for a copy of bulletin 451.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT
Sales Offices: Ansonia, Buffalo, Akron, Ann Arbor (Mich.),
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FARREL

FB-1156

1 **Continuous-tooth herringbone gears** are generated with high precision by the famous Farrel-Sykes process. Gears and pinions are finish-machined on their shafts to insure concentricity of pitch diameters with axes of rotation. Teeth are lapped for a smooth working surface. Rotating elements are balanced for freedom from vibration at high speeds.

2 **Shafts are large** for the power to be transmitted, giving added stiffness against bending and torsional deflections under peak-loading variations. They are ground to a finished diameter with tolerances of plus .000", minus .001".

3 **Oversize bearings** have the capacity to shrug off shock loads. They are the precision-finished sleeve type, split, turned and bored...fitted to bored seats in the housing.

4 **Very sturdy housing** holds rotating elements in original alignment—preserves the operating smoothness of the precision-generated gearing.

Bulletin 709 Size 1 Solenoid Starter in NEMA Type 7 enclosure for hazardous gas locations

Cut Costly Inspection Time

Allen-Bradley starters provide millions of operations without maintenance

Valuable maintenance time can be saved by eliminating "routine" inspections. Install Allen-Bradley starters, and you can forget them for long periods of time—they will prove completely reliable without regular "service" inspection.

It's the simple solenoid contact mechanism in Allen-Bradley starters that makes this possible. There is only ONE moving part—and this is your assurance of millions of trouble free operations. There are no bearings to corrode and stick . . . no flexible jumpers to wear and break. In addition, their double break, silver alloy contacts are always in perfect operating condition—and remain so until completely worn away. Also, all A-B starters have permanently accurate and reliable thermal overload relays that protect motors against burnouts—whatever the atmospheric conditions may be.

Specify Allen-Bradley *quality* motor control . . . you'll save much valuable maintenance time—and maintenance dollars.

NEMA 4
Watertight
Weatherproof

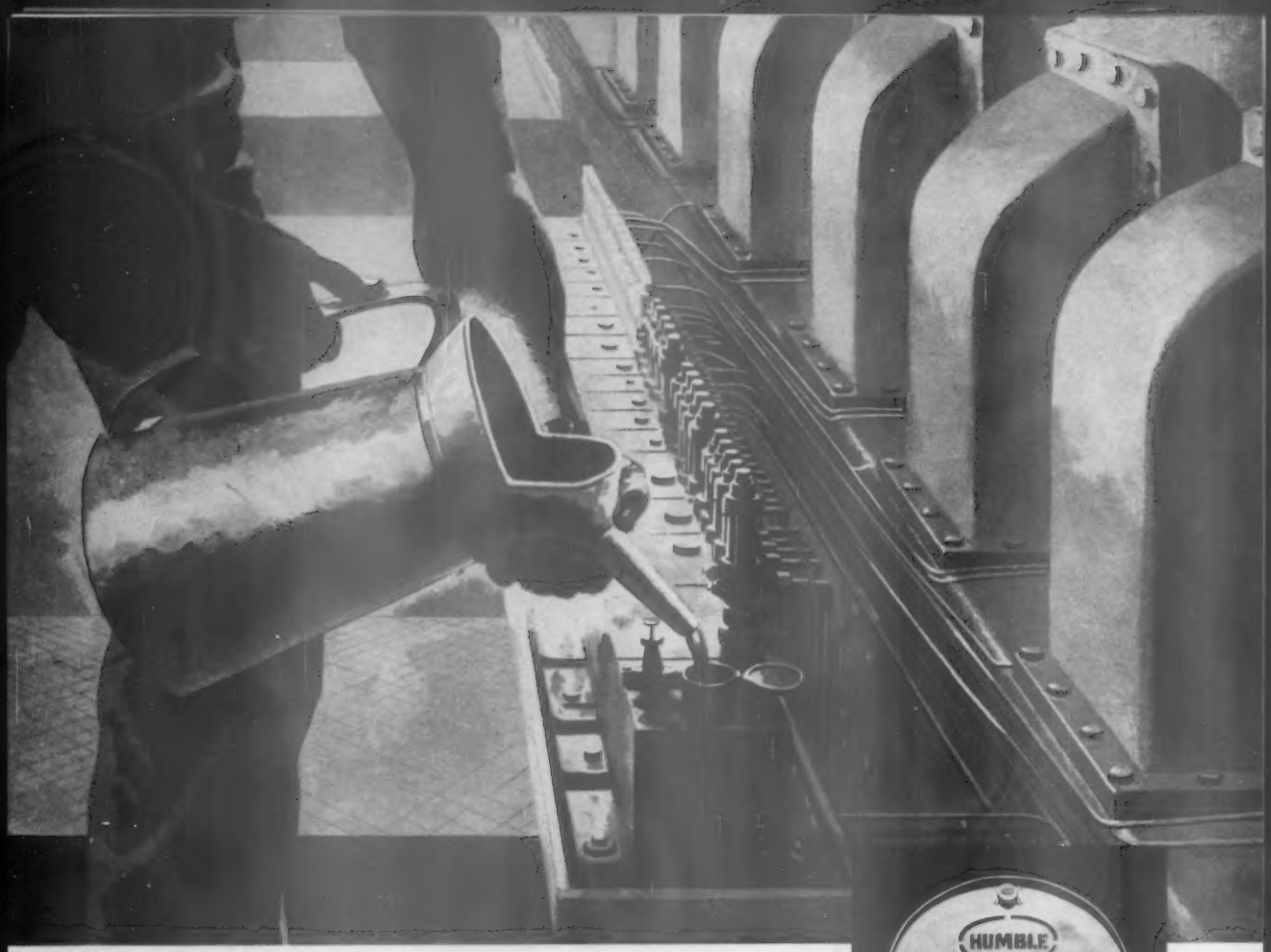
NEMA 9
For Hazardous
Dust Locations

NEMA 8
For Corrosive
Hazardous Gas

NEMA 11
Corrosion-
proof

Allen-Bradley Co., 1304 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY Quality Motor Control



Humble Lubricants promote peak operating efficiency – longer engine life.

Humble produces a complete line of industrial oils for every lubrication need.

Humble industrial oils are produced from the best of crude stocks. These are carefully refined in Humble's great Baytown Refinery. Selected additives are blended in to give special qualities — detergency, rust and oxidation prevention, low pour point, increased film strength.

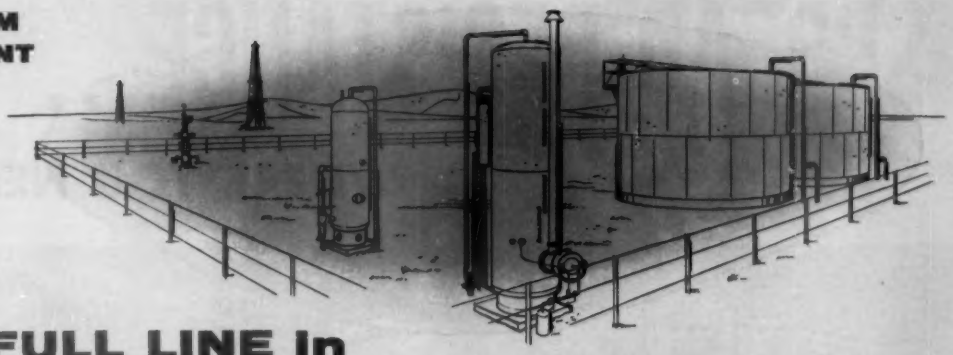
Humble industrial oils minimize engine deposits and reduce friction wear — allowing your engines to maintain peak operating efficiency and peak power output longer without costly down-time.

For complete information on Humble industrial lubricants see your Humble salesman, or phone or write: Humble Oil & Refining Company, Consumer Sales, P. O. Box 2180, Houston 1, Texas

At your request one of Humble's trained lubrication engineers will make a study of your lubrication needs and give you specific recommendations for a lubrication program tailored to your engines. This service is without cost or obligation.

HUMBLE OIL & REFINING COMPANY HUMBLE

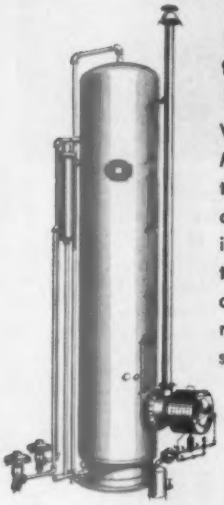
LONG-TERM INVESTMENT PACKAGE



the FULL LINE in OIL LEASE EQUIPMENT

SOLD-INSTALLED-SERVICED by PARKERSBURG

Wherever you operate, you can be sure of dependable service if you specify Parkersburg standard lease equipment, designed to withstand rugged treatment and the toughest oil field conditions. When you specify Parkersburg, your decision is backed up by our 60 years of experience in building proven equipment for the production of oil and gas. For quality and service, you can depend on Parkersburg.

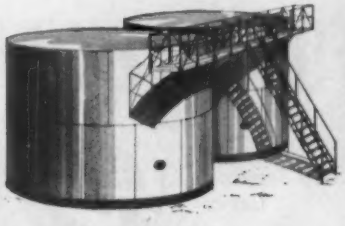


PARKERSBURG the FULL LINE in EMULSION TREATERS

Whether you operate in the Rocky Mountains or on the Gulf Coast, there's a Parkersburg treater available to fit your most exacting requirements. All Parkersburg treaters include the best features of conventional treating equipment, plus the built-in extra of simplicity and dependability.

PARKERSBURG the FULL LINE in SEPARATORS

Parkersburg oil and gas separators contain a patented vane-type mist extractor that has proven itself many times over. Provides maximum scrubbing of gas or entrained liquid . . . permits no pressure drop. For the most efficient separation of oil, gas and water, your best buy is Parkersburg.



PARKERSBURG the FULL LINE in BOLTED STEEL TANKS

Parkersburg stock and gun-barrel tanks are precision punched and formed to give you the tightest tank possible. This, plus Parkersburg's exclusive cloth-inserted tank packing, assures a leak-free, maintenance-free tank that will give many extra years of service. Ask the tank builder.

THE PARKERSBURG RIG & REEL CO. — QUALITY — PARKERSBURG WEST VIRGINIA — SERVICE — MADE IN U.S.A.

THE PARKERSBURG RIG & REEL COMPANY

Division of Parkersburg-Aetna Corp.

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SPREAD RESISTANCE...

WHERE YOU NEED IT!

Five styles in a broad range of sizes and capacities up to 18". Drop-forged from selected steel and heat-treated to further increase strength and reduce liability of springing. Screws are made of special grade steel hardened and tempered.

NEW Alloy Hoist Hooks add 27 additional capacities to Williams extensive line of carbon and alloy steel hooks. Eye and shank styles in regular and safety patterns. Safe working load capacities up to 70 tons. Write for new brochure A-575.

Vulcan Eye Bolts are proof-tested to military standards to 50% beyond "safe working load". Plain and shoulder patterns. Blank or threaded. Capacities from 400 lbs. to 16 tons.

all are stronger and safer because...

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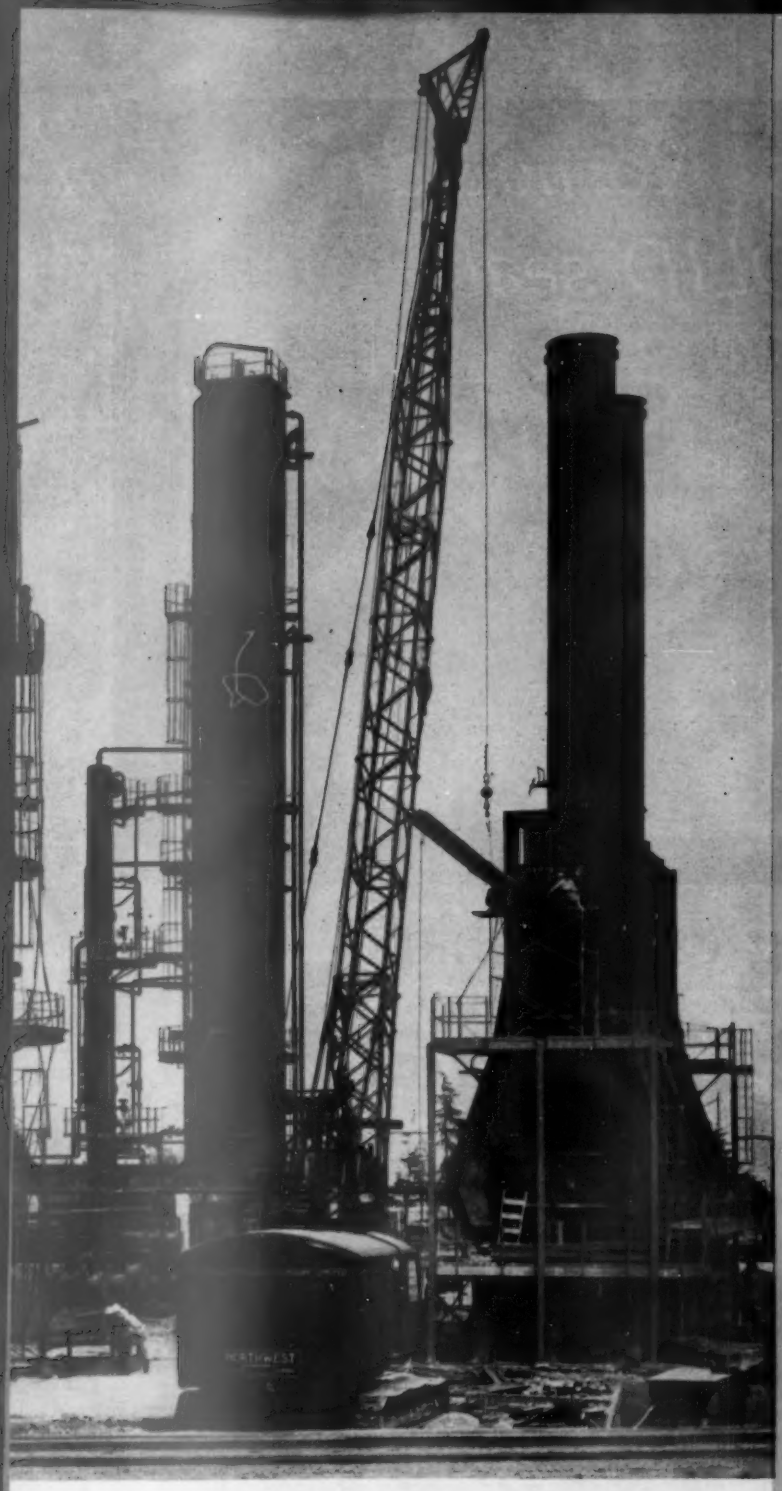

for those HIGH LIFTS *around Refinery or Rig!*

Perhaps nowhere is delicacy of control more important than in crane operation around a refinery or a drill rig.

Northwest brings you five mighty workhorses to choose from particularly equipped and suited to crane lifting problems in oilfield locations. From the 25-D to the big Northwest Model 95, you have a range from 13-ton to 60-ton capacity. Here is crane equipment that brings smoothness of performance in handling high lifts and long booms.

The Feather-Touch Clutch Control gives you the *true* feel of the load that assures accuracy for spotting a valve, holding a pipe for coupling, or the gentleness needed for setting a heavy load.

Northwest Uniform Pressure Swing Clutches are big, cool running and give you smooth engagement. They bring you freedom from the grabs and jerks that set a boom to jumping. With a Northwest you put a load where you want it without jockeying.

Northwest Boom Hoists meet any booming problem. The Northwest High Speed Boom Hoists are independent of all other machine functions and operate under power both up and down. If you need a third load line, a third drum is available.

Northwest Cranes bring you every advantage you need for crane work: Sectional Boom Hoist Rigging and Pendant Lines, Telescopic Boom Struts, Folding Gantries, Adjustable Jibs, Open-Throat Booms, Removable Counterweight, and a host of other advantages are either standard or available.

You will be interested in what Northwest has for you. Get the full story on the size machine you need before buying a crane.

CRANES
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DRAGLINES
PULLSHOVELS
TRUCK CRANES

3/4 to 3 Cu. Yd. Capacity

NORTHWEST

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1513 Field Building, 135 South LaSalle Street, Chicago 3, Illinois

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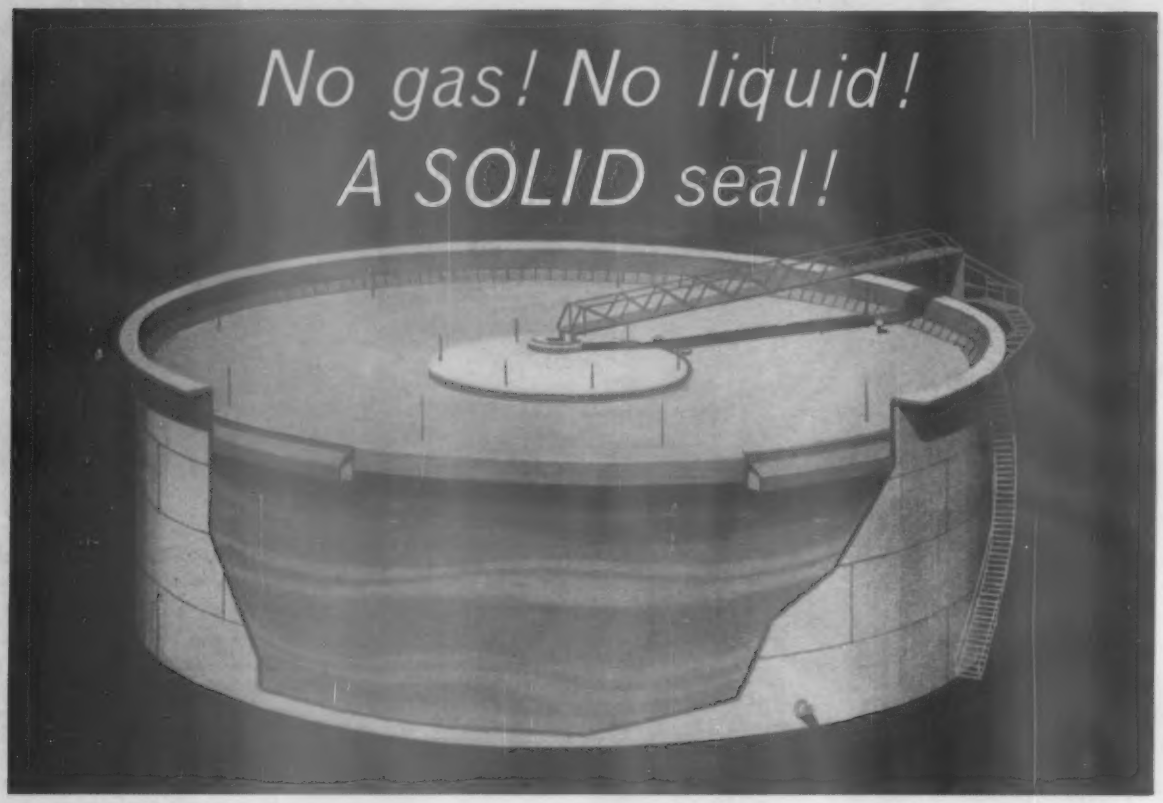


nothing can disable

EverSeal*

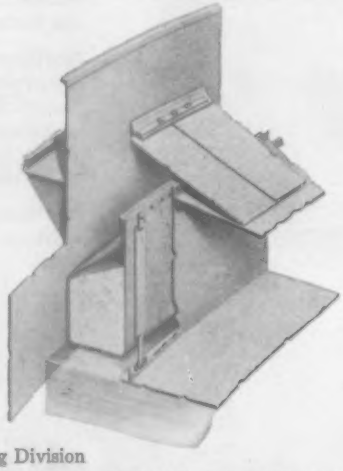
General American's new cushion seal for floating roofs

Tear it! Gouge it! Puncture it! The seal will hold. No matter what the damage, it will not burst or rupture! There's nothing in EVERSEAL to spill or leak.

Urethane cushions firmly joined and enclosed in a vapor-tight, no-scuff envelope of BUNA "N" and PVC are protected by the General American weather hood.

EVERSEAL resists the abrasive action of rough tank walls, yet will not scratch or damage tank coatings.

Get the complete details about EVERSEAL! Write the General American office nearest you. For any type of conservation structure, *it pays to plan with General American.*



WHY THE NEW GENERAL AMERICAN EVERSEAL IS FAR BETTER THAN ANY TUBE TYPE SEAL

1. No liquid or gas to leak
2. Replace entire seal or a section without taking roof out of service
3. EVERSEAL will accommodate a 10" variation in annular space between roof and shell
4. No moving parts—nothing to corrode
5. Costs less than most other seals
6. Permits full travel of roof, yet rides easily over projections on shell and maintains seal
7. Protected from sun, rain, snow and dirt by the General American weather hood
8. Eliminates buildup of vapors in seal area
9. Will not freeze to sides of tank
10. Provides full protection for oxygen-sensitive stocks

*Patents Pending

Plate & Welding Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

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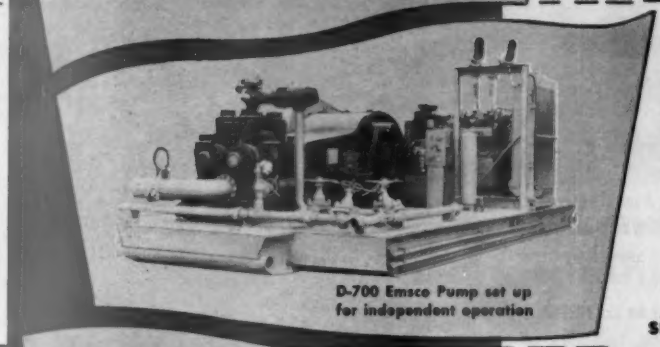
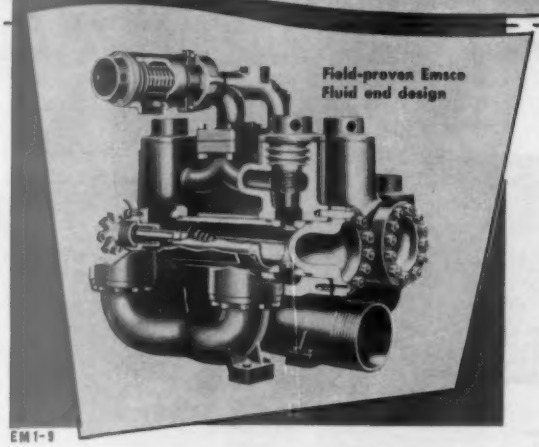
High performance . . . LOW weight . . . from EMSCO

DA-850 Emsco Pump with Mid-Continent Swinging pump drive



D-700 Emsco Pump set up for independent operation



Field-proven Emsco Fluid end design

EM1-9

"D" SERIES PUMPS

Emsco's rugged herringbone gear train and weight reducing Fabriform construction offer more horsepower per pound than any other slush pump. The fastest possible penetration is assured while transportation costs and rig-up time are held to a minimum.

For increased efficiency and simplified maintenance, Emsco's steel fluid end design features solid cylinder heads with no liner lock bolts, exposed liner construction to lessen possibility of fluid end washouts, and threaded valve pot covers to permit easy access to valves. Let a Mid-Continent representative help select an Emsco Pump for your drilling requirements.

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Here's Why Oil Men Specify—

EC&M
HIGH VOLTAGE STARTERS

2200-4800 VOLTS
FOR
PRESSURIZED ROOMS
OUTDOORS
INDOORS

left • Type AH Starter (50,000 KVA, certified) for Division 2 Applications. NEMA 3R (raintight) Enclosures for mounting outdoors
below • Diesel loading pump station in southwestern refinery

EC&M Starters are standardized for *easy selection.* They are *easier to install* because they are shipped with all internal wiring complete. They are designed for *easier, faster inspection and maintenance.* And—they *save valuable space* because they are compact with no sacrifice in accessibility.

EC&M's Type AH Starters are available in NEMA 1 or 3R (raintight) enclosures for outdoors, indoors or pressurized control rooms. Three interrupting ratings: 50,000 KVA—POWER FUSED—and VALIMITOR®

Write for Bulletin 8131-C

Five EC&M Aligning Starters with Incoming Line and Feeder Panels for Pumps and Compressors (Pacific Coast Refinery)

Pressurized Control Room with ten NEMA 1 EC&M Enclosed Starters in midwest refinery

THE ELECTRIC CONTROLLER & MFG. CO.
A DIVISION OF THE SQUARE D COMPANY
CLEVELAND 28 • OHIO

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BEST BUY IN 2-WAY RADIO!

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- NEW CABLING SYSTEM
- 5 WATTS OF AUDIO
- "ROAD MAP" CIRCUITRY
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New RCA Transistorized "Low Drain" Mobile Unit Greatest Value...in Performance...Service...Price

Looked at from any angle—performance, service, price—the new "LD" (Low battery Drain) 2-Way Radio is sensational news from the leader. Minimum tubes in the receiver, no vibrators in the power supply—they've been replaced by readily available stock transistors for long life and dependability! Transistors used only in circuits where long experience has proven they can give reliable performance. Your RCA representative will be glad to show you why the "LD"—dollar for dollar, feature for feature—is today's greatest 2-way radio value.

Heat drain reduces internal temperature of unit up to 40%, providing longer component life (case has wrap-around heat sink). Standby monitoring feature cuts battery drain to a mere 2¼ amps. With vehicle engine off, radio can be left on to receive incoming messages for long periods without impairing battery life—automotive cabling used exclusively for greater flexibility, positive contact, corrosion resistance. Five watts of audio power for greatest message intelligibility. Equipment easily moved from car-to-car—trunk or true-dash mount. Security sealed circuits clearly numbered to provide "road map" for fast, simple servicing—RCA Service Company technicians available to keep your equipment operating at maximum efficiency.

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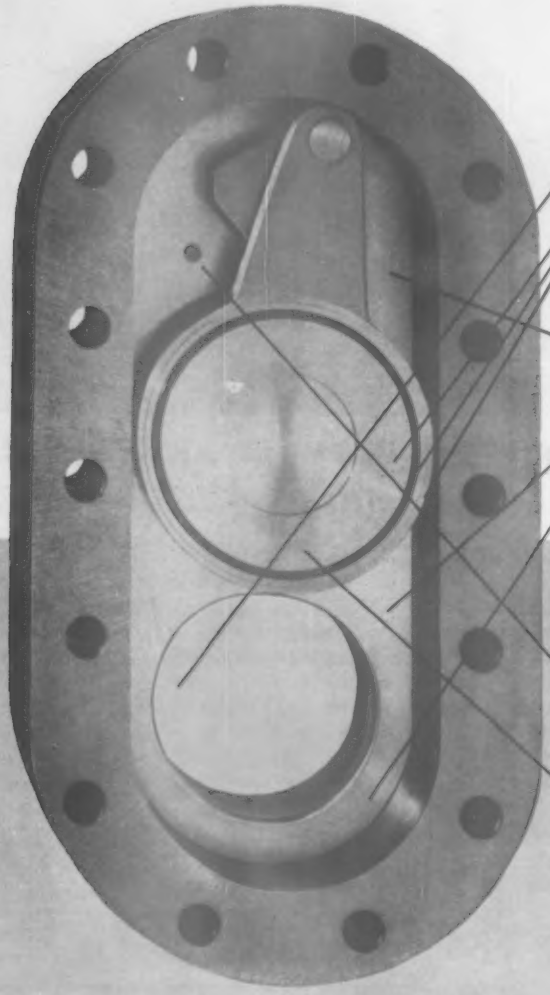
GROVE
Series
G-5

A new, with all the



Full Opening

Protected Seal-O-Ring Design—Unique Grove engineering places nitrile rubber O-rings and rugged metal seat rings on the gate, so that when in the open position, they are completely elevated away from foreign matter in the flow stream.

Continuous, Perfect Contact—Metal seat rings are firmly held in contact with polished and chrome plated body side plates to guarantee a continuous contact for scraping action through all gate positions. Squeegee action of the Seal-O-Rings maintains an immaculate surface on the side plates for perfect sealing.

No Lubrication—Ever

Bleeder Plug—Permits venting body cavity in closed position.

Springs Behind Seat Rings—Firmly hold both metal seat rings against polished body side plates.

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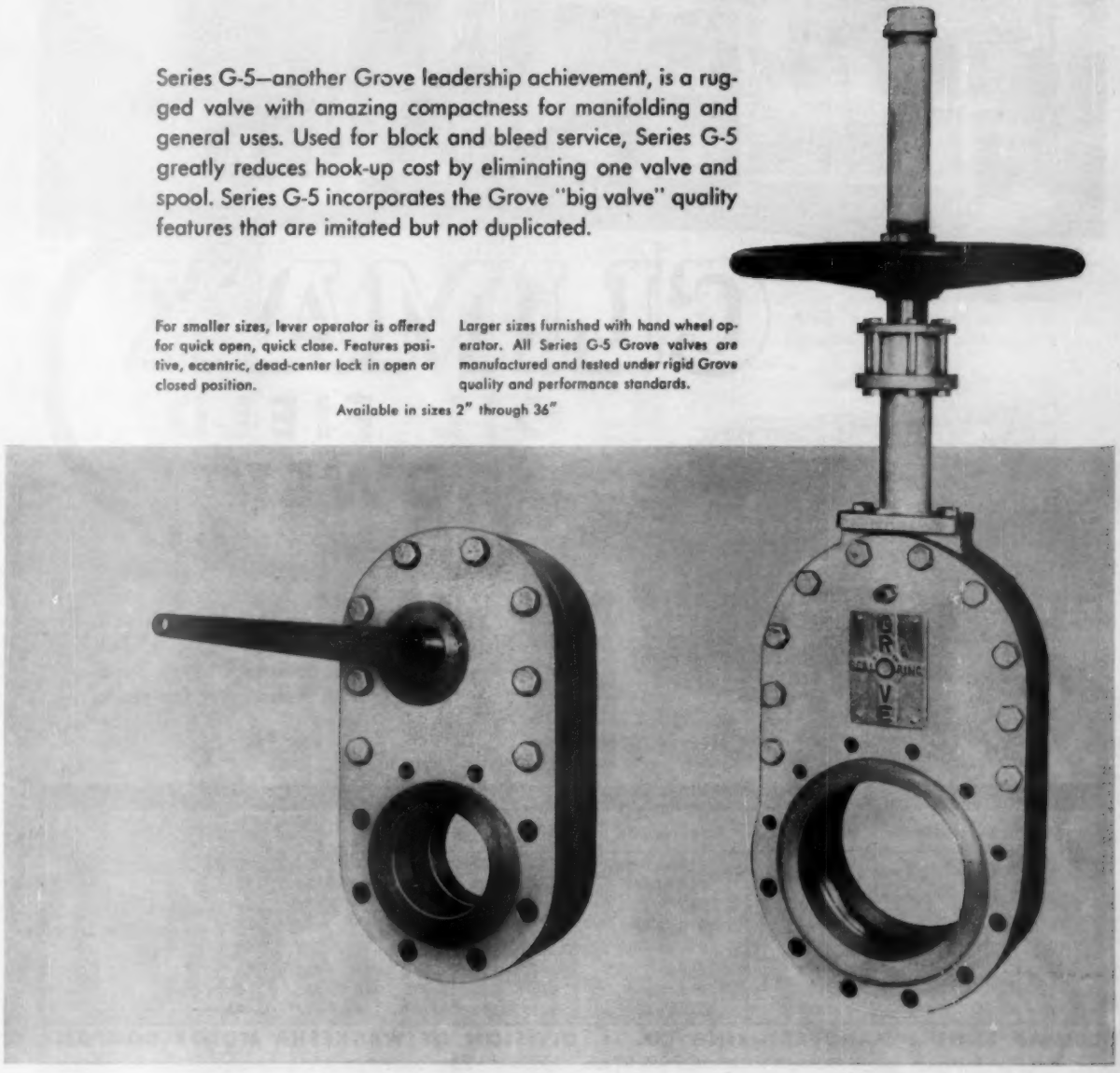
more compact valve proven GROVE features!

Series G-5—another Grove leadership achievement, is a rugged valve with amazing compactness for manifolding and general uses. Used for block and bleed service, Series G-5 greatly reduces hook-up cost by eliminating one valve and spool. Series G-5 incorporates the Grove "big valve" quality features that are imitated but not duplicated.

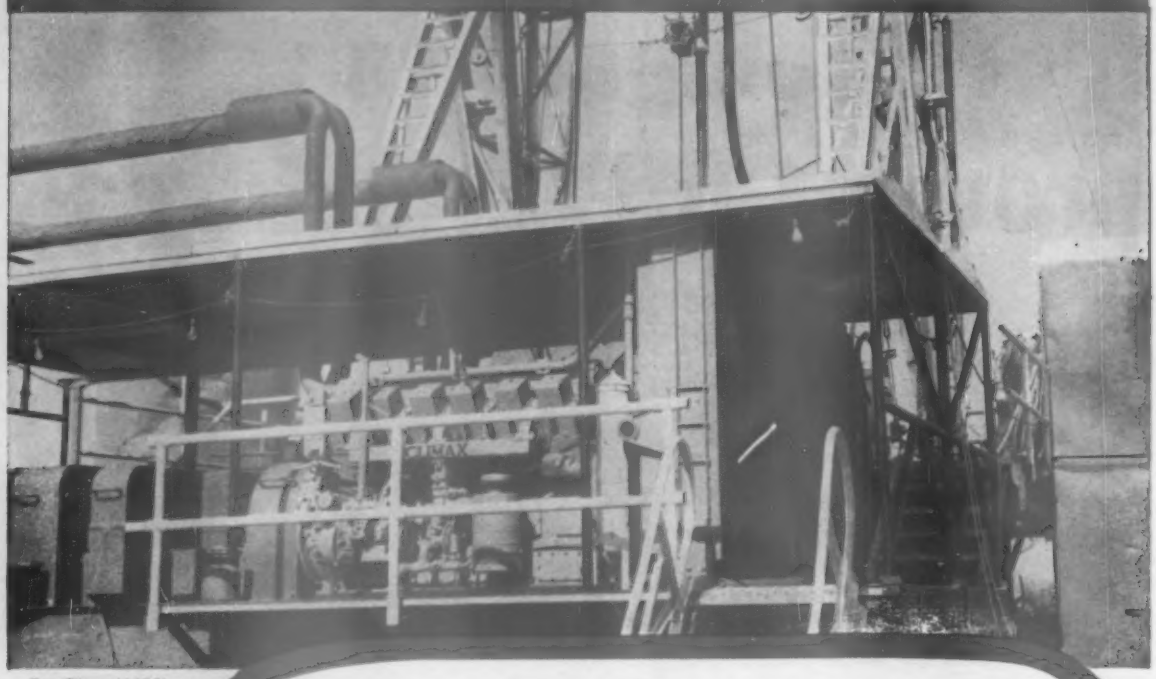
For smaller sizes, lever operator is offered for quick open, quick close. Features positive, eccentric, dead-center lock in open or closed position.

Larger sizes furnished with hand wheel operator. All Series G-5 Grove valves are manufactured and tested under rigid Grove quality and performance standards.

Available in sizes 2" through 36"

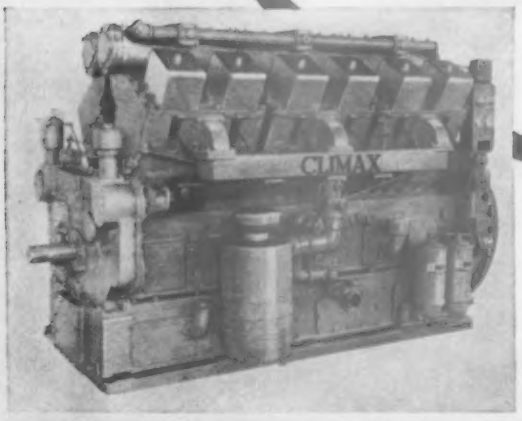


where the PAY-OFF is on RELIABILITY!



Two Climax V-125's on a Cleveland County, Oklahoma rig.

CLIMAX
OIL FIELD POWER



Climax Engines have proven their reliability in hundreds of oil field installations. Single, well balanced design, rugged construction, and quality materials make them smooth running . . . for years!

Model V-125
Max. hp 605 (Natural Gas)

CL-107

POWER UNIT PUMPING and DRILLING HP—CONTINUOUS DUTY

MODEL	Bore and Stroke	Displacement	Torque @ RPM	BRAKE HORSEPOWER AT SPEEDS INDICATED					
				600	700	800	900	1000	1100
R-110	6⅛ x 7	824	468 @ 800	52	62	71	79	86	91
R-165	6⅛ x 7	1238	684 @ 750	81	93	105	117	127	135
K-67	7 x 7	1616	955 @ 803	110	129	145	161	176	188
K-75	7½ x 7	1855	1090 @ 800	126	146	166	185	204	218
V-80	7 x 7	2155	1240 @ 850	140	163	188	210	230	246
V-85	7½ x 7	2474	1440 @ 900	164	194	223	246	266	284
V-122	7 x 7	3232	1915 @ 900	217	258	293	328	353	378
V-125	7½ x 7	3711	2220 @ 850	242	292	340	384	417	442

Write for descriptive literature

CLIMAX ENGINE MANUFACTURING CO. • DIVISION OF WAUKESHA MOTOR COMPANY
FACTORY—CLINTON, IOWA

It couldn't be done without the RUBBER SLEEVE Core Barrel

Complete core recovery, even in soft, unconsolidated or fractured formations

Just over a year ago, Christensen Diamond Products Company introduced an entirely new concept in core packaging to the oil industry ... the Rubber Sleeve Core Barrel.

Since that time, many formations that were formerly difficult or impossible to core, have been cored successfully with the rubber sleeve core barrel.

This rubber sleeve barrel actually encases the core in a protective rubber package, which reduces contamination to a minimum and eliminates many of the bridging, crumbling and jamming problems encountered with conventional barrels.

The rubber-packaged cores are ideal for handling and shipping and can be easily stored without altering the physical or fluid content, thus eliminating the need for freezing or canning of cores.

And now, laboratories have developed techniques which enable them to obtain accurate reservoir information without removing the core from the rubber sleeve, even with softest formations.

If your problem is poor core recovery, call Christensen, and learn how you can get "good" cores at "Less Cost Per Foot."

Diamonds Mean, "Less cost per foot."

CHRISTENSEN DIAMOND PRODUCTS

1937 SOUTH SECOND WEST • SALT LAKE CITY, UTAH

For more detailed information and case histories on the Rubber Sleeve Core Barrel, or any of Christensen's complete line of conventional and wireline core barrels, write or call Christensen Diamond Products Company.

Now... Hammel-Dahl offers 4 split body valve types.. 14 *interchangeable* actuators

...the first complete line of split body valves with interchangeable pneumatic, electric, electro-hydraulic and manual actuators.

And you get more capacity in these advanced split body designs. A variety of interchangeable actuators provide optimum flow control under any conditions. Standardization reduces engineering and maintenance costs too. Check your classified directory for your local Hammel-Dahl representative or General Controls Factory Branch Office. Or write for a new brochure on the split body line.

Specifications

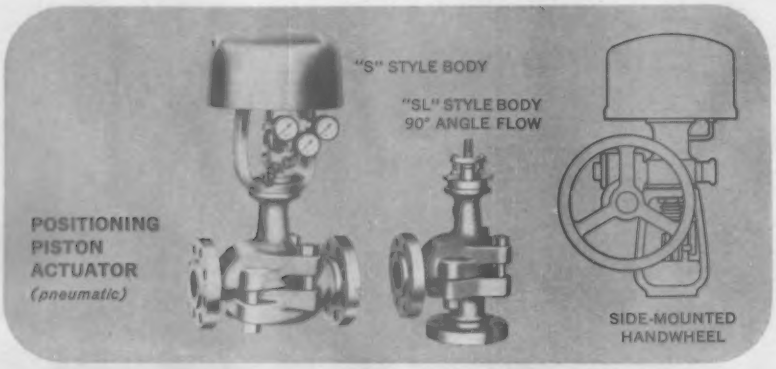
Sizes: ½" – 8"

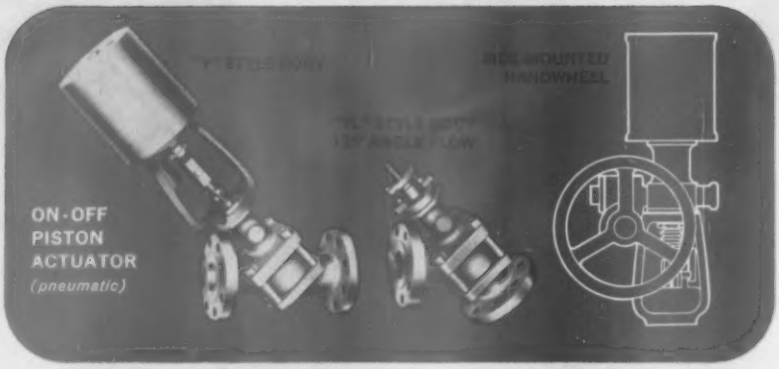
Connections: 150 to 1,500 lb. ASA flanged. Screwed or welding ends through 2". Separable or integral flanges.

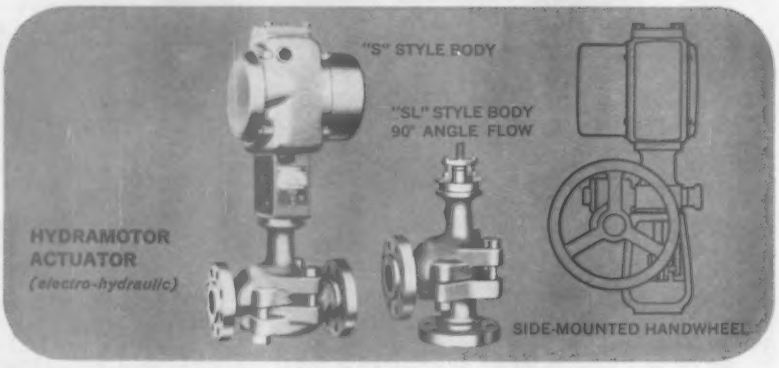
Bodies: Carbon steel, 316 SST, nodular iron, bronze or any castable alloy.

Trim: Materials and characteristics as specified.

Face-to-Face: I.S.A. Standard – all sizes on "S" and "SL" bodies – through 4" size on "Y" and "YL" bodies. Non-standard face-to-face also available.







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HAMMEL-DAHL DIVISION

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REPRESENTATIVES IN PRINCIPAL CITIES OF UNITED STATES, CANADA AND EUROPE

Have Crews...will travel

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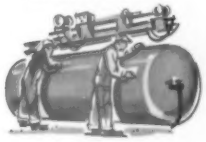

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What you need in field erection... When you need it...Where you need it

Our field crews at Solar Chicago are craftsmen capable of handling the erection and construction of pressure vessels, towers, tanks, shells or other structures. These men have stacked up years of experience and have been organized into highly efficient mobile crews ready to tackle the toughest job. They find it no problem to translate your needs into the structure you require on your site, on time.

When you require any field erection, why not call Solar Chicago? We welcome your inquiry.

Write today for our brochure.

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Valve sealed with VITON® still gives positive shutoff after 1 year in benzene line

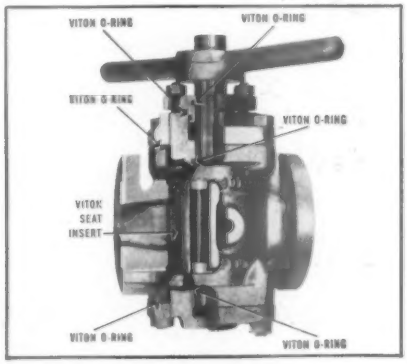
VITON synthetic rubber doesn't swell in the presence of benzene. In these valves at Richfield Oil Company, it has performed well for over a year. Cutaway photo of the valve, right, shows how VITON is used as O-ring and primary seat material.

Here you see a pair of General Duo-Seal Valves in benzene service at Richfield Oil Company's Wilmington, California, Refinery. For more than a year these valves have depended on reliable Du Pont VITON synthetic rubber parts to assure positive shutoff. VITON does not swell in the presence of benzene and other aromatics; it keeps its strength, shape and size—even at elevated temperatures.

Richfield is just one example. Other refineries have successfully used VITON-sealed valves for handling toluene, xylene and blends of these aromatics with other petroleum stocks . . . for 380° F. alkylate gas and for propane at temperatures as high as 400° F.

New Du Pont VITON synthetic rubber offers this kind of resistance to many types of oils, fuels, solvents and corrosive chemicals. Added to this, VITON shows outstanding resistance to high temperatures (450° F. and *up*). It has low compression set, high modulus and good tensile strength . . . plus resistance to ozone, oxygen and weathering.

Such products as gaskets, O-rings, seals, coated fabrics, hose and tubing made from this new synthetic rubber are setting performance records throughout industry. Ask your supplier about the application of VITON parts in your operation. For free booklet describing VITON, write to: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. 06-11, Wilmington 98, Delaware.



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SYNTHETIC RUBBER

NEOPRENE
HYPALON®
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ADIPRENE®

Better Things for Better Living . . . *through Chemistry*

"Old Faithful" is a modern reminder of volcanoes that raged thousands of years ago. Still hot, volcanic rock deep beneath the earth heats water around it beyond surface boiling temperatures. This water expands under pressure into steam, exploding upward with such force that it pushes a column of water as high as 150 feet and more into the air.

there's more to Cities Service than meets the eye!

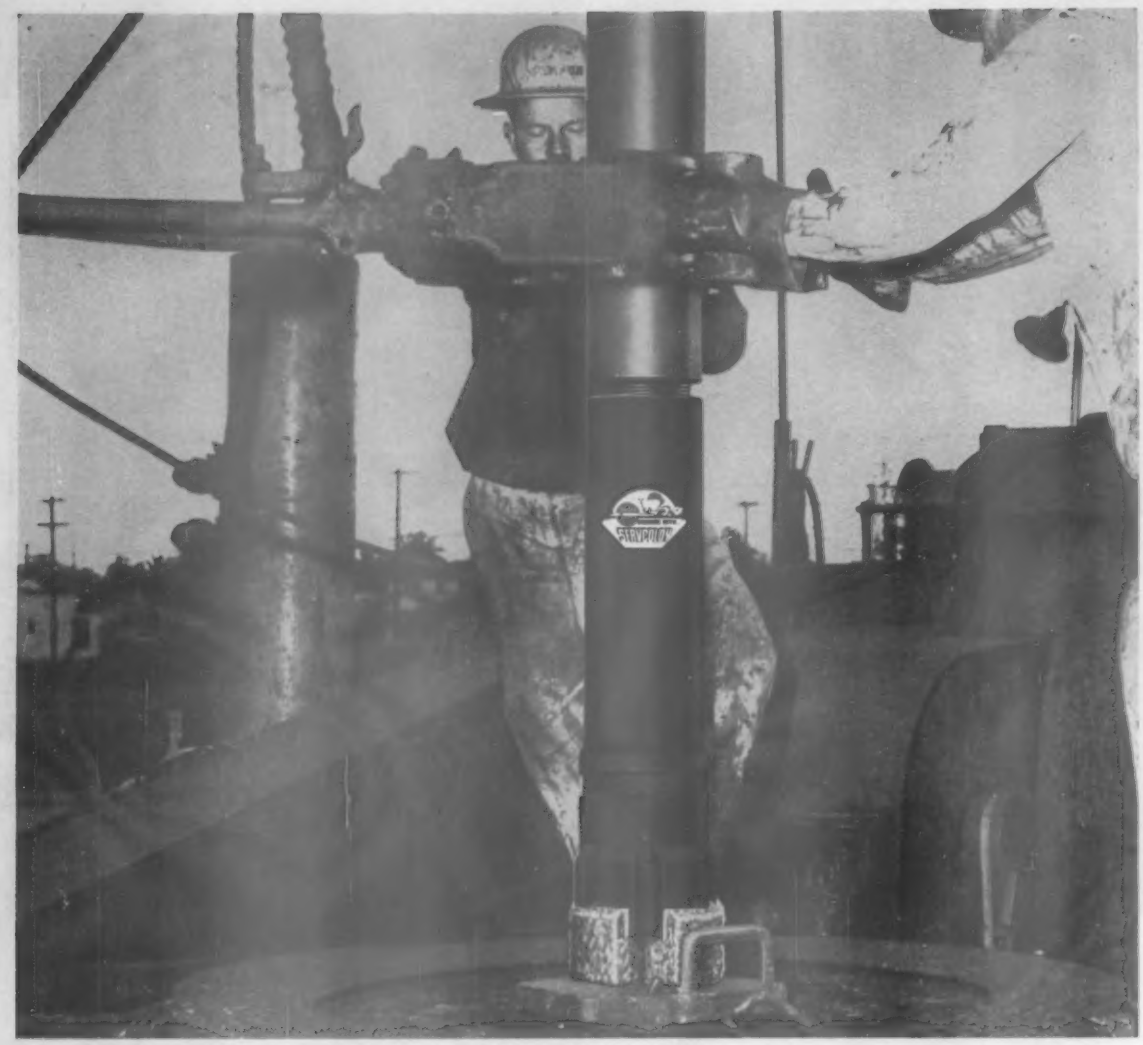
"Old Faithful" is as entertaining as it is punctual. But few observers realize they are actually watching the steaming aftermath of great volcanoes which raged thousands of years ago.

Similarly, the facts of oil company operations escape the casual observer. Not many for example, would imagine that Cities Service products are found not only at service stations but as ingredients in drugs, plastics, clothing, building materials and countless other items. Few envision the world-wide operation this entails.

To help meet present petroleum needs, Cities Service has invested a billion dollars in modern facilities. Meeting future demands will be even more costly. Thus, within the past two years, Cities Service has spent over $350 million for this purpose.

Only in this way can America be given what she must have for progress—more jobs, more and better petroleum products.

OIL'S FIRST CENTURY
BORN IN FREEDOM
WORKING FOR PROGRESS



Three 6⅛" Bit Cones milled up in 2 HOURS!

Servcoloy-dressed Junk Mills chew up bit cones and other junk with amazing speed; makes this method of removing a fish fast, safe, and very economical.

After three cones from a 6⅛" bit were left on bottom, two rock bits, two hydro-bailers, and two junk baskets were run during a three-day period in attempts to either recover or sidetrack the three cones. Results were negative.

A six-inch Servco CJ Junk Mill dressed with Servcoloy, was then run in the hole. A total of two feet of hole was drilled in a period of two hours of milling. The operator ran back with a bit and proceeded to drill a head. Fine steel cuttings were caught on the shaker during the milling and appeared on the mud screen during the succeeding day, showing that the *cones were actually milled up, not sidetracked.*

Other operators running the Servco Junk Mill report similar results. The astonishing cutting properties of Servcoloy have completely changed thinking about down-hole milling. Why not get complete information from your nearest Servco office?

WHAT IS SERVCOLOY? *

Servcoloy is a patented, hard-facing material which uses a unique method of suspending bits of carbide in a tough, elastic matrix. As the carbide cutting edges are worn away or torn from the matrix, new edges are automatically exposed. Servcoloy is now being used on Servco milling tools such as section mills, rotary shoes, taper mills, pilot mills, etc. Remedial work which formerly took days to do is now being done in hours.

SERVCO

General Offices: 2440 Cerritos Ave., Long Beach 6, California
Gulf Coast and Mid-Continent: 4850 Gasmer Street, Houston 35, Texas
Canada: 6909 - 104th Street, Edmonton, Alberta **Venezuela:** Maracaibo

Field Offices: Ventura, Bakersfield, Lafayette, Harvey, Oklahoma City

*U.S. Patent No. 2,833

RIG-UP FASTER.. MAKE HOLE SAFER

with CONTINENTAL-EMSCO B-SERIES PORTABLE MASTS

FASTER — Continental-Emsco's B-Series Masts shorten rig-up time to a minimum. Exclusive rear leg pivot permits time-saving low-level assembly.. even with high substructure no ramps are needed. Mast sections and crown assembly quickly go together with simple pin connections.

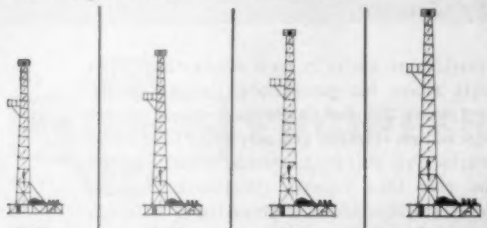
Mast raises smoothly, safely in one continuous operation. There's no need for snubbing lines, since C-E's B-Series masts never go over center.. raising lines remain in tension at all times during raising or lowering. Masts can be moved in one piece or knocked down into easily portable sections.

SAFER— All load bearing base connections are at floor level and can be readily seen by the driller. Leveling, to correct substructure settlement, is quick and easy. Driller has a clear view to top of mast, since interior and skew bracing is kept to a minimum. C-E's mast design allows maximum block travel for faster, safer hoisting.

All C-E masts meet API specifications for hook load and substructure capacity. Wind load capacity is 75 mph with full setback of pipe.

Contact your local C-E representative for full details.
Continental-Emsco Masts are also available through leading supply stores.

Choose your next mast from one of these..

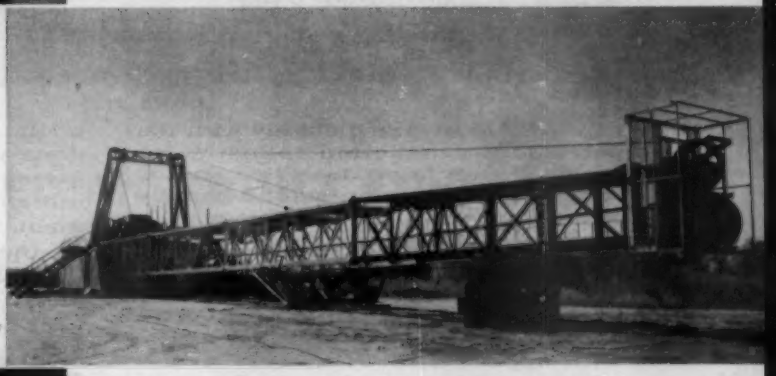


B-127
Clear Height 127',
Nom. Gross Capacity
416,000 lbs.

B-133
Clear Height 133',
Nom. Gross Capacity
590,000 lbs.

B-134
Clear Height 134',
Nom. Gross Capacity
830,000 lbs.

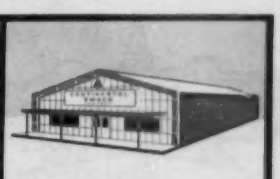
B-142
Clear Height 142',
Nom. Gross Capacity
1,053,000 lbs.



For Service that Sings.. Equipment that Hums.. Go..

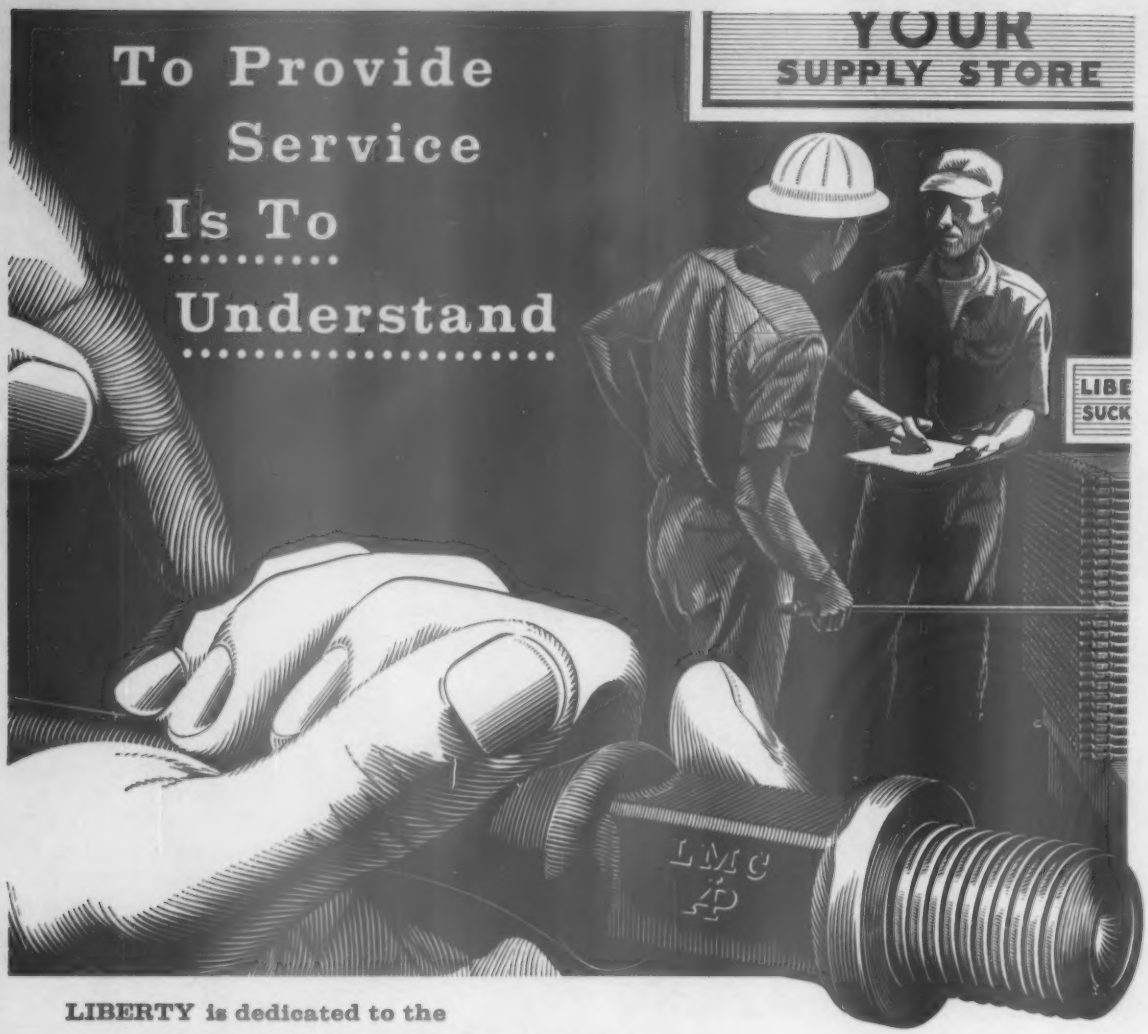
CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide



M902

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company • General Offices: Dallas, Texas • Export Division: 30 Rockefeller Plaza, New York, N. Y. • Continental-Emsco Company Limited General Offices: Calgary, Alberta, Canada • Continental-Emsco Company C.A., Caracas, Venezuela • Plants: Houston and Garland, Texas; St. Albans, Herts., England • *Representatives in All Principal Oil Fields of the World*



LIBERTY is dedicated to the understanding and consideration of the problems of both Supply Stores and Producers.

LIBERTY has worked closely with the petroleum production industry for over 40 years to produce fine sucker rods and pumping units for a rapidly advancing petroleum technology.

LIBERTY is proud of its contribution to the never-ending quest to reduce the cost of producing oil. The LIBERTY ¼" SUCKER ROD, latest product of LIBERTY technology, has been met with approval by Producers everywhere and is in widespread use in slim-hole and dual-completions. Early results indicate that more well completions will now be possible because of savings from 30 to 60% on each well utilizing slim-hole pumping equipment. This in turn means increased business for the many dedicated and friendly Supply Stores through which all LIBERTY products are sold.

LIBERTY subscribes to the belief that what is best for Producers will be best for Supply Stores and Equipment Manufacturers.

**FOR EXCELLENT PRODUCTS AND SERVICE,
SPECIFY LIBERTY SUCKER RODS AND PUMPING UNITS.**

LIBERTY

MANUFACTURING COMPANY OF TEXAS

4025 HEMPHILL STREET • FORT WORTH, TEXAS

LM-6

World's Largest Ethylene Unit

KELLOGG ENGINEERED AND BUILT FOR ESSO

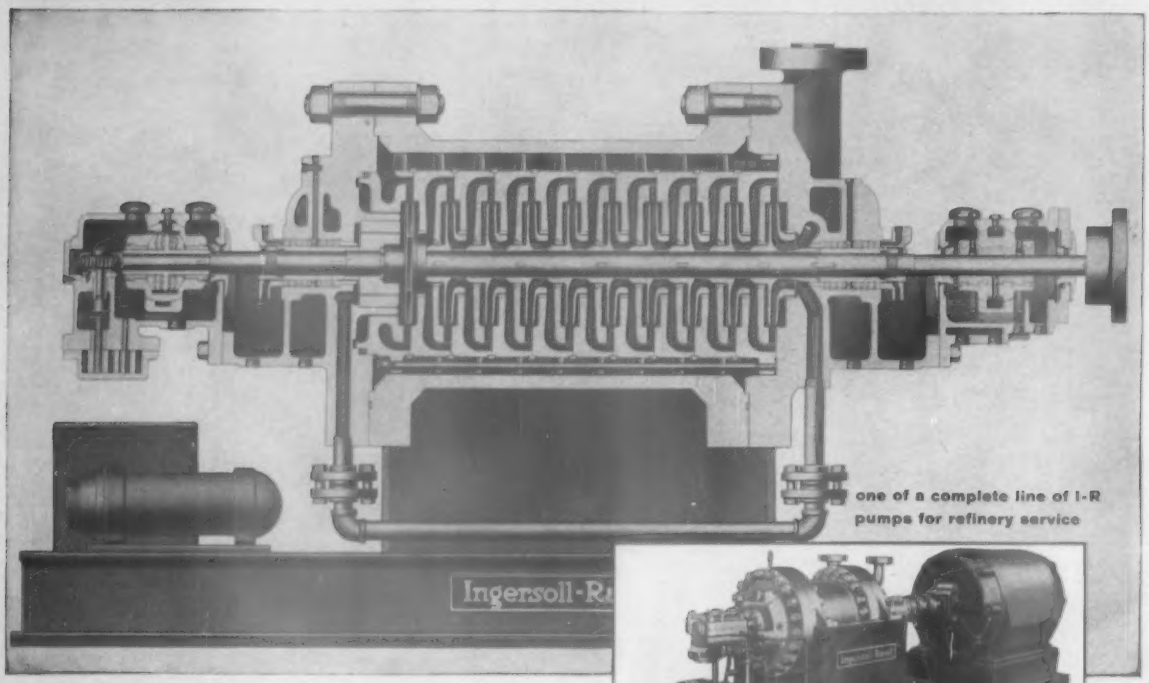
Currently producing high purity ethylene at a rate in excess of 300 million pounds annually, and designed for ready expansion, Esso Standard Oil Company's Purification Unit at Baton Rouge is larger than any operating in the world today. It is one of twelve major ethylene manufacturing and recovery plants engineered by Kellogg for leading oil and chemical companies in the U.S. and Europe.

THE M. W. KELLOGG COMPANY

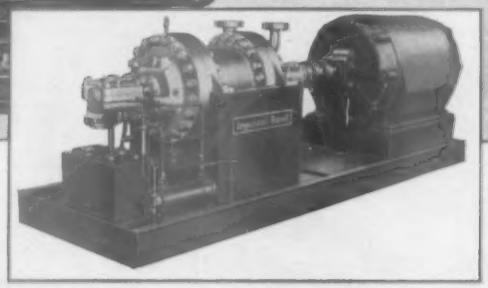
711 Third Avenue, New York 17, N. Y. *A subsidiary of Pullman Incorporated*

The Canadian Kellogg Co., Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., Buenos Aires • Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

NEW INGERSOLL-RAND CHARGE PUMPS
Offer Longer Life on High-Pressure Process Service



one of a complete line of I-R pumps for refinery service



. . . *featuring proved "Unit-Type" Rotor Assembly*

The new Ingersoll-Rand CMR pump is specifically designed for high-pressure process service, where operation without a spare requires top performance and exceptional dependability. It is a horizontal, multi-stage unit with vertically-split barrel-type casing, suitable for a wide range of low-capacity, high head applications in refineries or other process plants.

Available in 1½ and 2½ inch discharge sizes, the CMR pump will efficiently handle capacities up to 400 gpm, pressures to 1500 psi and temperatures to 750°F.

Some of the outstanding features are noted below. For complete information, contact your Ingersoll-Rand representative.

FEATURES:

- **High-Strength Casing** . . . The main barrel is made from centrifugally-cast steel with forged steel ASA flanges welded at both ends. The nozzle head and discharge head are one-piece carbon steel castings which bolt to the casing flanges. The main casing joints are sealed with confined flexitallic gaskets. The pump can be dismantled without disturbing the piping connections.
- **"Unit-Type" Rotor Assembly** consists of separate channel ring segments, impellers and shaft. It can be easily removed from the pump as a unit to facilitate maintenance.
- **Impellers and Wearing Rings** . . . The single-suction, closed type impellers are cast in one piece and mechanically balanced to assure smooth, vibration-free operation. Casing rings, pressed into the channel rings, and locked against rotation, are easily renewed to maintain close running clearances.
- **Hydraulic Balance** . . . Multiple-volute diffusor construction completely eliminates radial thrust. A balancing drum effectively counteracts axial thrust due to pressure differentials across each stage. Residual thrust is taken up by the thrust bearing.
- **Bearings** . . . Spherically seated, self-aligning Kingsbury thrust bearing and sleeve-type radial bearings are pressure lubricated by a gear oil pump driven from the outboard end of the shaft. An oil reservoir and shell and tube-type cooler are mounted on the pump base.

Ingersoll-Rand

10-795 11 Broadway, New York 4, N. Y.

PUMPS • COMPRESSORS • GAS & DIESEL ENGINES • AIR & ELECTRIC TOOLS • TURBO BLOWERS • CONDENSERS

STOP JET EROSION ON TUBING with GUIBERSON'S

TUBING PROTECTOR RUBBERS

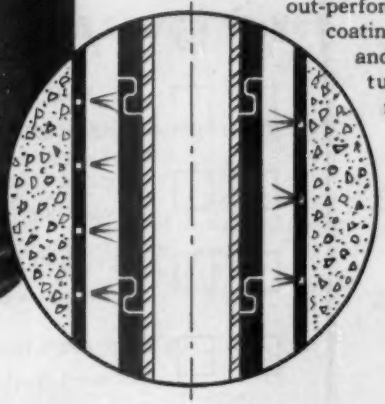
INTERLOCKING TYPE

Protect that joint of tubing opposite casing perforations from jet stream impingement with Guiberson rubbers. Tough and resilient, they absorb the jet stream energy that erodes away steel tubing.

Compression molded from a special compound developed in Guiberson's Rubber Laboratory, these extra-dense rubbers have highest resistance to live oil and gas.. excessive bottom hole temperatures. At the same time, they eliminate cutting and abrasion by sand.

Self-aligning, interlocking design completely covers tubing and speeds up installation (no exposed gaps). We field install them at no extra cost to stay put on 2" or 2½" tubing. They snap into place under light tension.

Independent laboratory tests, made under the severest sand and live oil jetting conditions, show Guiberson tubing protector rubbers out-perform and far outlast other coatings.. such as lead, plastics and hard metal. Guiberson tubing protector rubbers not only save tubing, but may save a pulling job.



OVERLAPPING TYPE

Guiberson's overlapping type tubing protector rubbers are available in 2" and 2½" tubing sizes. The 2" size is designed to pass through Guiberson drillable packers.

THE GUIBERSON CORPORATION

ESTABLISHED 1919 — DALLAS, TEXAS U. S. A.

PIPELINE INSPECTION

TIMES FASTER BY HELICOPTER THAN BY FOOT

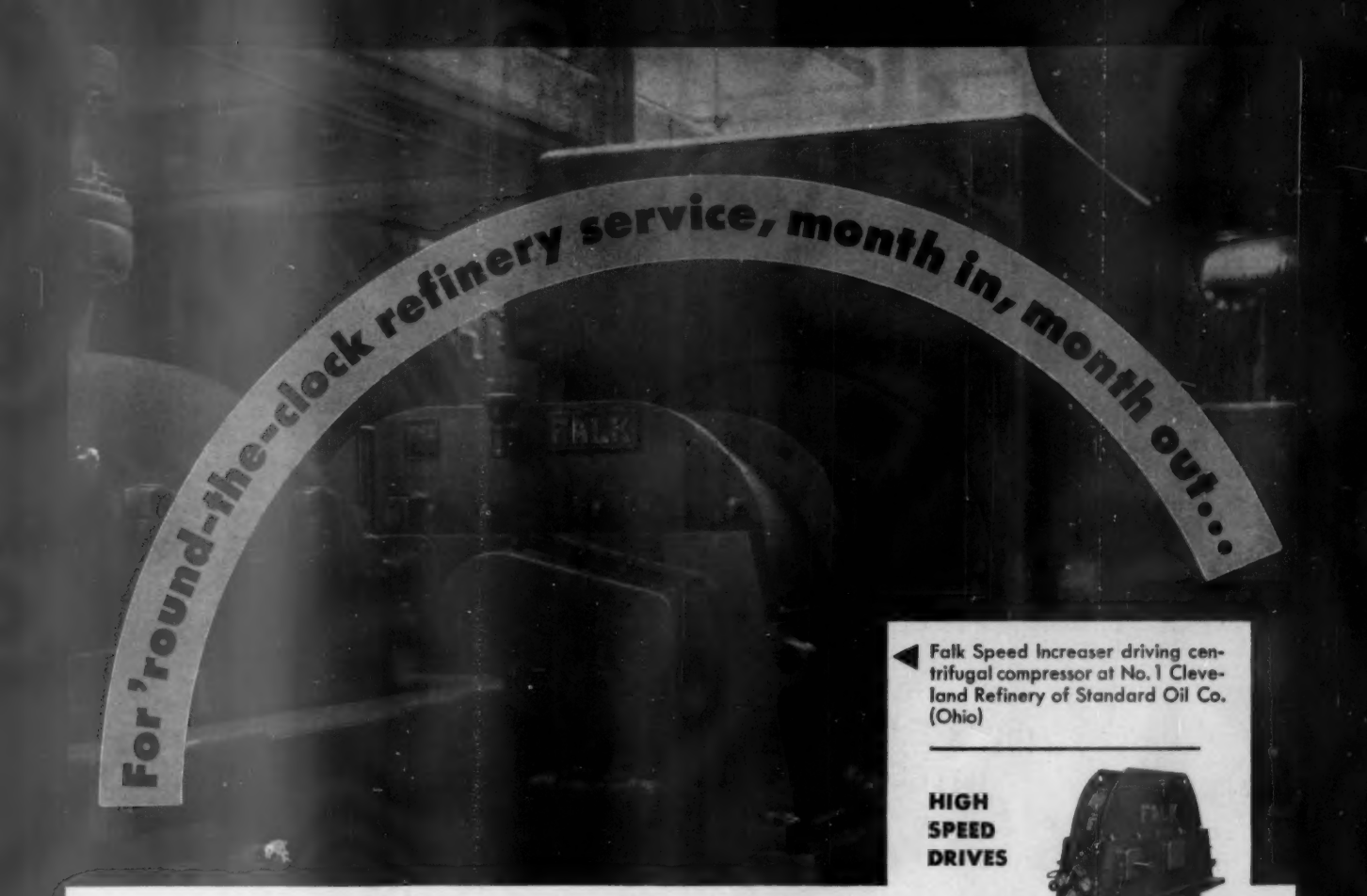
Pipeliners have discovered the Bell helicopter. You'll see the Bell saving them money wherever you look. Its ability to cut patrolling costs (as pointed out above) is remarkable enough . . but this is only a fraction of the story. For a glimpse at the Bell's amazing efficiency on your payroll — both in pipe stringing and maintenance — take a minute to run down the adjoining list of questions. We call it the BELL PENCIL TEST. You'll call it an eye-opener for pipeline contractors and operators.

YES	NO	
☐	☐	We have pipeline stations that require over 300 miles of ground travel.
☐	☐	Our construction schedules must be met, regardless of weather.
☐	☐	We've been using tracked vehicles to get equipment into some locations.
☐	☐	We need a fast communication and coordination link between field units.
☐	☐	We could sign up 1000 to 5000 new industrial customers next year if construction of new distribution facilities could be speeded up.

Now, tear out just the test portion of this page and mail it—with your name, title, company and address—to: Department 226K, Bell Helicopter Corporation, Fort Worth, Texas. We'll send you additional information about the Bell in Pipeline Business.

BELL
HELICOPTER CORP.

FORT WORTH, TEXAS • SUBSIDIARY OF BELL AIRCRAFT CORPORATION



◀ Falk Speed Increaser driving centrifugal compressor at No. 1 Cleveland Refinery of Standard Oil Co. (Ohio)

FALK offers a complete line of standard high speed and semi-high speed drives

type P Ratios—from 2.5:1 to 12.0:1.
Horsepower—up to 2000 hp per 1000 rpm of high speed shaft.
Maximum speed of high speed shaft: 10,000 rpm.

type Q Ratios—from 1.15:1 to 9.5:1.
Horsepower—up to 1800 hp per 1000 rpm of high speed shaft.
Maximum speed of high speed shaft: 10,000 rpm.

type H Ratios—from 2.22:1 to 9.89:1.
Horsepower: up to 1100 hp.
Maximum speed of high speed shaft: up to 3600 rpm.

type S Ratios—from 1.49:1 to 25.4:1.
Horsepower—up to 224 hp.
Maximum speed of high speed shaft: 4500 rpm.

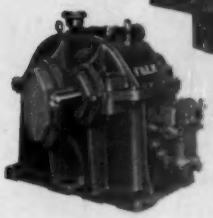
SPECIAL DRIVES...to any required speed and horsepower.

• • • • •

Designed and produced by the Falk engineers who pioneered the ultra-high speed gear units for aviation turbo engine test facilities, Falk standard high speed drives are widely used in refineries throughout the country. Our technicians will be glad to work with your engineers or with your equipment suppliers to select and produce drives precisely suited to your operation.

FALK is a Registered Trade Mark.

HIGH SPEED DRIVES

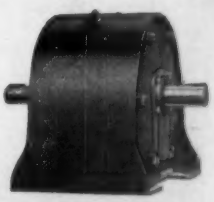


type P

type Q

SEMI HIGH SPEED DRIVES

type H



type S

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives in Most Principal Cities

FALK

...a good name in industry

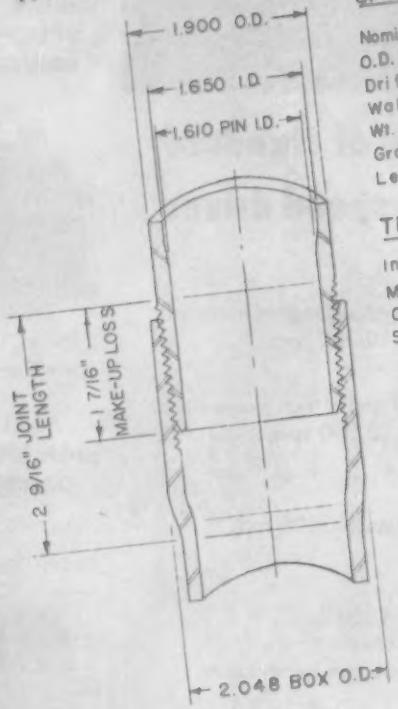
10/15/59

MEMO TO: Field Superintendent –

This could mean big savings on our dual completions and slim hole program. Suggest you look into it.

J.C.C.

1 1/2" x .125 WALL TEX-TUBE INTEGRAL JOINT OIL WELL TUBING



SPECIFICATIONS

Nominal size	1 1/2"
O.D.	1.900"
Drift I.D.	1.556"
Wall	.125"
Wt. / ft.	2.40 lbs.
Grade	J-55
Length	Rg. 2

TECHNICAL INFORMATION

Internal Press.- min. Yield	6,330 PSI
Mill Test	3,000 PSI
Collapse Press.	5,767 PSI
Setting Depths: (feet)	
Collapse s.f. 1.125	10,280
Tension s.f. 1.8	7,100

1 1/2"- 10 Rd. Reg. Thrd. Interchangeable with 1 1/2" A.P.I. Non-Upset Tubing

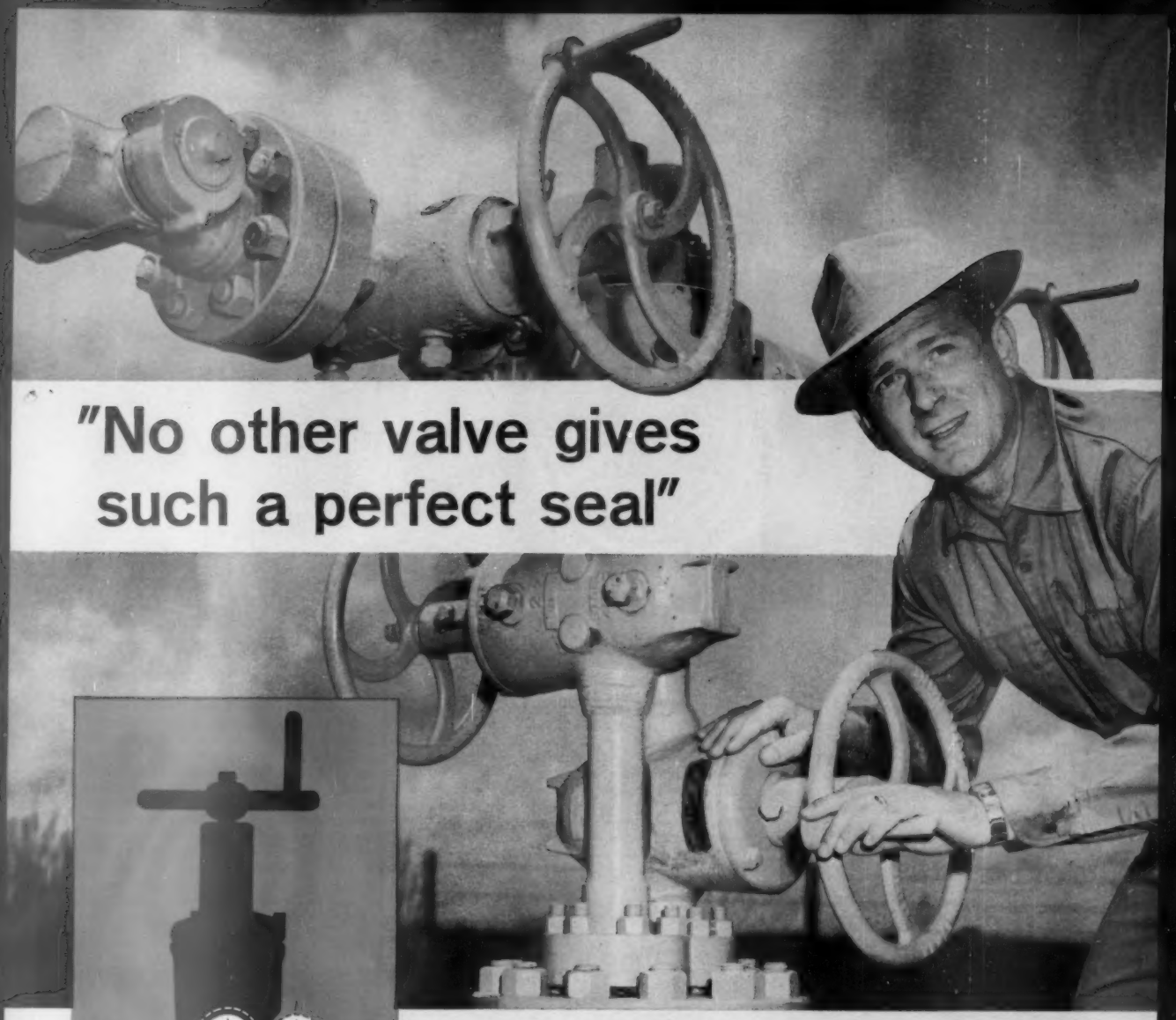
CONSUMER PRICES f.o.b. Houston, Texas	
Carload	$ 50.13
Less than carload	$ 55.44

POWER TIGHT MAKE-UP AT 350-450 FT. LBS.
1 1/2 THREADS – TOLERANCE ± 1 1/2 THREADS

1 1/2" SERIES 301 x .125 Wall integral Jt.

TEX-TUBE, INC.
1503 North Post Oak Road
Houston, Texas

DRWN. BY TVS	DATE 8-1-59	SCALE —
CKD BY AM	APV. BY KCW	1 1/2"-301-.125
SHEET 1 OF 1 SHEETS		



"No other valve gives such a perfect seal"

W-K-M Recessed Body Valves feature through-conduit gate construction, pressure seal bonnets, super-finished stems supported on roller bearings — and can be overhauled on-the-line.

Sizes: 1½", 1¾", 2", 2½" and 3". **Working Pressures:** 2000 through 5000 pounds.

PRODUCT OF W-K-M's *Creative Engineering*

W-K-M® Recessed Body Valves for Multiple Completions

No other valves give you such tight sealing, such dependable control.

W-K-M's Controlled Force Seating creates an initial bubble-tight seal between the gate and Teflon inserts. As the gate assembly expands, a tight metal-to-metal seal is achieved. Result: a perfect *Double Tight Seal* without body or seat lubrication.

Next time — and every time — specify W-K-M! Recessed Body Valves are available for dual and triple completions. *At leading supply stores everywhere.*

WRITE FOR CATALOG 200

W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5906-R

PUMPAGE

Goulds news about pumps for process industries

Rocket's red roar

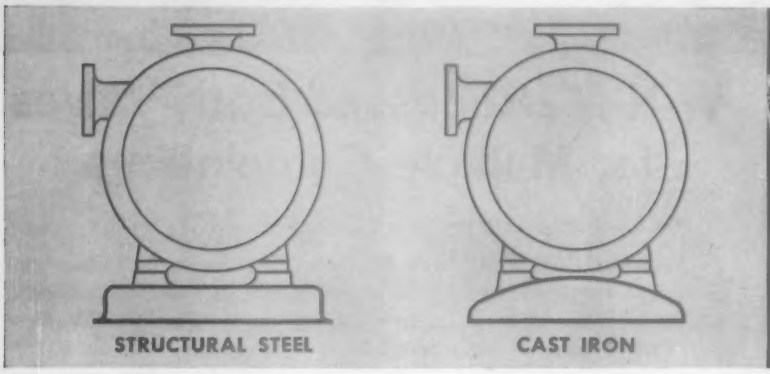
After the countdown—a roaring and soaring! The fuels that make rockets roar contain highly abrasive solids, ignite and burn rapidly with the slightest contact with air or oxygen. Handling them is a problem—pumping temperatures run as high as 550° F. For one government installation, Goulds developed a vertical process pump with an inert gas chamber that is used as a barrier between pumpage and rotating shaft seal. Gas pressure is maintained by an automatic purgerator slightly above suction inlet pressure to insure no contact between the mechanical seal and the abrasive solids. This pump has been found so broadly applicable that it is now a standard model in our line.

Now . . . a centripetal pump!

A unique use of centripetal action lets Goulds Fig. 2520 handle liquid, air, or liquid *and* air! The centrifugal force of the impeller separates the liquid from the lighter air, which accumulates at the center of the impeller and casing. The liquid, circulating at the casing periphery, is directed (by centripetal action) toward the center, pushing the air ahead of it and through the discharge. Once primed, this pump *stays* primed! It can't air bind—even with loops or leaks in your suction line. Handles foaming solutions and emulsions easily. You can use it for almost anything: as a scavenger, for transfer work, for cleaning up, for pilot plant work. Ask for Bulletin 725.6 for all the details!

Latex: Handle with Care

Before synthetic latex can become the bouncy consumer products you see here, it must be a fairly instable liquid, able to gel or coagulate easily. For that reason, a pump must handle latex gently or the impeller will clog and have to be cleaned frequently. Such a pump is the Goulds Fig. 3715—six of which are presently being used by a rubber manufacturer to transfer latex from storage tanks to tank cars and in the latex concentrator line. A semi-open impeller allows a minimum of mechanical shock or friction at optimum efficiency. Normal cleaning operations are performed easily, because the casing cover and impeller can be easily removed without disturbing pipe connections. Bulletin 725.4.



Cast-iron bedplates

A rigid well-grouted bedplate under your pump and driver is the first requirement for trouble-free operation. Accordingly, Goulds furnishes rigid corrosion-resistant cast-iron bedplates as standard at no extra cost. The Goulds special camber top prevents accumulation of corrosive liquids. The camber design with its large accessible grout hole at the high point insures complete fill-up of bedplate cavity with grout. This economical design, jig-drilled for pump and motors, provides integral motor pad, eliminating costly separate motor base.

GOULDS PUMPS

Get all the news monthly—FREE!

If you've liked reading about the new designs and applications of pumps as presented on PUMPAGE, then you'll appreciate getting a sister publication, GOULDS NEWS, mailed to you free every other month. GOULDS NEWS is a 4-page newsletter that highlights new developments in pumps and profitable ways that they are used. You can add your name to our mailing list by merely writing, on your letterhead, to Goulds Pumps, Inc., Dept. OG-119 Seneca Falls, N. Y.

We Make Them All

Bethlehem makes flanged-and-dished heads to meet virtually every requirement: ASME Code, elliptical and standard flanged-and-dished. Also flanged-only, dished-only, shallow-dished, double-dished, and heads for special requirements.

Bethlehem heads are available in diameters up to 144 in. They are made in thicknesses from 14 gage to 2½ in. Bethlehem also produces standard manhole and hand-hole saddles, covers and fittings, and also heads with flued openings. A number of sizes of ASME Code flanged-and-dished heads are stocked for prompt delivery.

Because of the uniformly high quality of steel from which Bethlehem Flanged-and-Dished Heads are made, proper welding technique produces sound welds every time.

A letter or phone call to the nearest Bethlehem sales office will bring you a copy of our stock list. Or write to us direct at our offices at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: **Bethlehem Steel Export Corporation**

BETHLEHEM STEEL

BETHLEHEM STEEL

How to make tracks at pig-running time!

Unibolt hinged scraper traps are the answer

But not even a Unibolt Scraper Trap . . . with its easy-opening two-bolt coupling, its free-swinging hinged closure, its tight-sealing, long-lasting resilient gasket . . . can take all the work out of catching a pig. It comes mighty close, though, to making the job of starting and catching scrapers a trouble-free operation.

Unibolt originated the hinged closure to eliminate the troublesome, time-consuming multi-bolt blind flange. And the Unibolt self-sealing resilient gasket that remains in place when the closure is opened seldom, if ever, needs replacing. This saves you money as well as time. And a Unibolt Scraper Trap installed on an oversize barrel, the i.d. of which is slightly larger than the o.d. of the line, eliminates "fighting" the pig in and out of the trap. Line pressure does the heavy work.

The Unibolt Hinged Blowdown, or blowoff head, is an ideal companion to the Unibolt Scraper Trap on gas line service.

Complete details are carried in Bulletin PL-590, copies of which will gladly be sent on request.

A hinged type Unibolt Scraper Trap in closed position.

UNIBOLT

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

company

"A ~~MAN~~ IS KNOWN BY THE

customers it

~~COMPANY HE~~ KEEPS"

Repeat orders are a continual source of pride at Pacific. They indicate the success of our pumps in satisfying the needs of our customers.

Since 1923, Pacific Pumps Inc. has been supplying dependable centrifugal pumps to refineries, chemical plants and similar process installations. Thousands of Pacific process pumps are now contributing to plant efficiency throughout the world.

Pump design and manufacture are not the only features of this enviable performance record. Pacific has a skilled service engineering staff. These men are available when needed... anytime, anywhere.

For complete information about Pacific centrifugal pumps for process service, write to:

PACIFIC PUMPS

Inc... A Division of Dresser Industries, Inc.

HUNTINGTON PARK, CALIFORNIA

PACIFIC

Offices in all Principal Cities

Oilfield jobs make some of the toughest hauling in the world—yet Autocar handles them all with ease and sureness!

"Easy with Autocar . . . tough with anything less"

Out in the oilfields where terrain is rugged and loads are giant-sized, custom-engineered Autocar trucks and tractors handle with ease the jobs that would tear lesser rigs apart.

This heavy-duty tractor is designed to get maximum loads of equipment where it's needed, when it's needed, with greater dependability and lower maintenance.

Every Autocar is custom engineered to specific operating conditions. *Every* component is designed to form an integrated, balanced unit for the job you want it to do...providing unequaled strength, ruggedness and staying power that make any job cost less.

See it, drive it . . . and you'll never again settle for anything less than the "world's finest."

Autocar
"World's Finest"

Division of
The White Motor Company
Exton, Pa.

Now "PACKAGED" AUTOMATION of Valve Operation, with LimiTorque

Minimize use of these costly components!

- Separate push button stations
- Separate reversing controllers
- Control racks
- Conduit runs, conduits
- Enclosures, piping, wiring
- Labor required for above items

Saves 50% on Equipment & Installation costs

Once again LimiTorque is first . . . LimiTorque valve operators now offer integral mounted NEMA rated reversing controllers, push button and indicating light elements. You can actually reduce the installation and component equipment costs up to 50%.

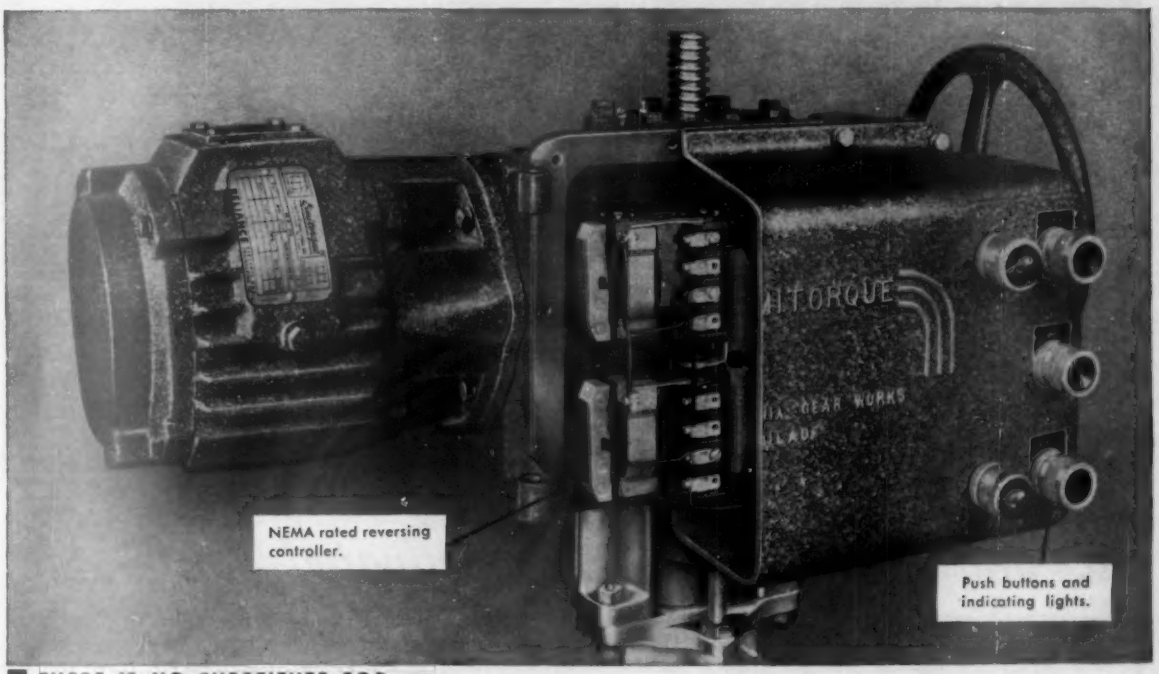
Various combinations of control items can be included in the same switch compartment. Eliminate costly separate control components when they are obtainable completely wired in your LimiTorque.

To compensate for temperature ranges, overloads are adjustable from 85% to 115% of the heater rating.

Push button elements, selector switches, etc., when required, are mounted in the hinged cover for quick, easy accessibility to all control components. LimiTorque can be field mounted on your existing valves. Contact your valve manufacturer or closest LimiTorque sales engineering office.

Remember, today's trend is toward low cost simplicity. LimiTorque operators with integral controls are designed with this in mind.

Write for further information.



THERE IS NO SUBSTITUTE FOR —

LimiTorque®

PHILADELPHIA GEAR CORPORATION

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS

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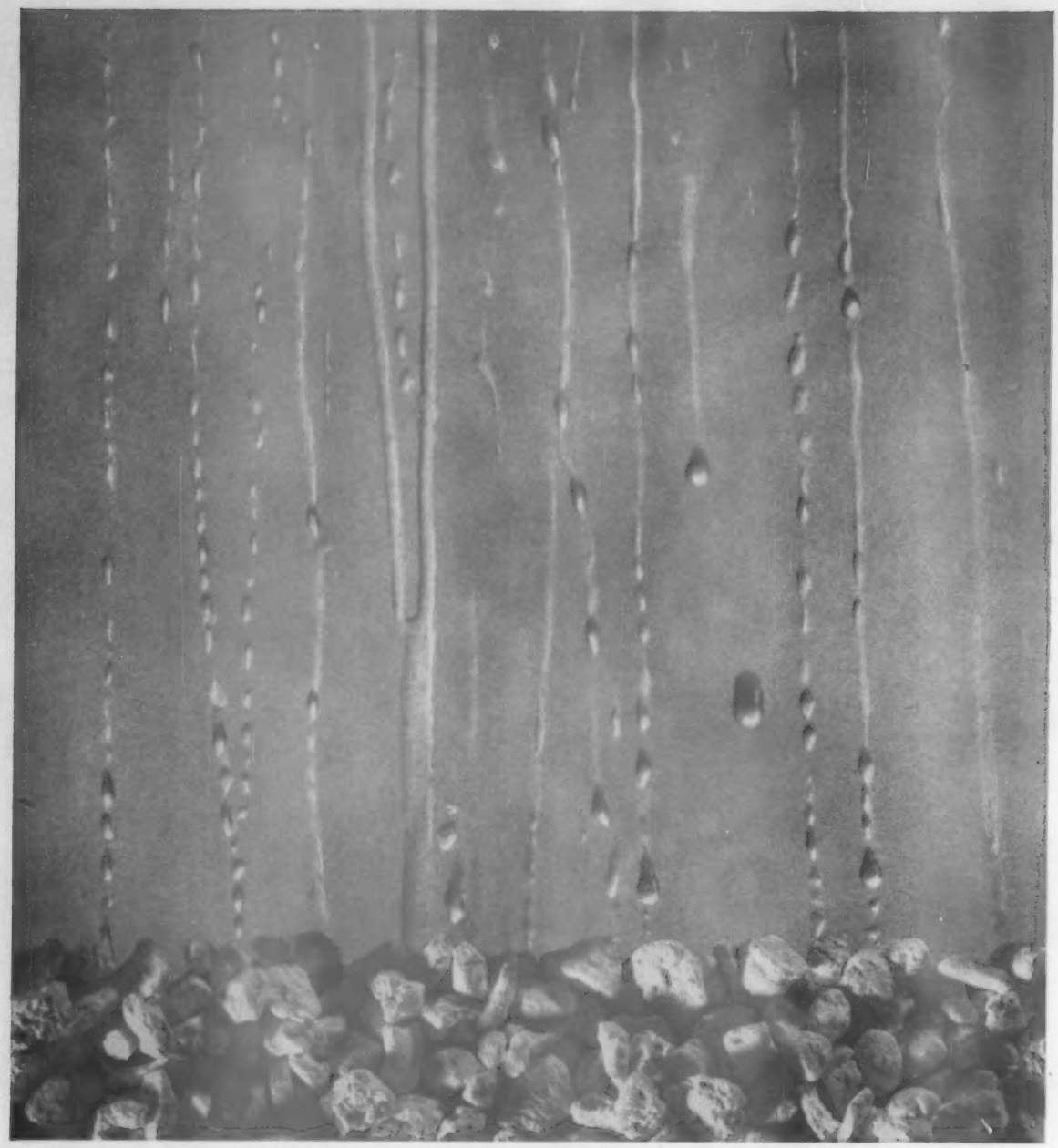

Unwanted water may ruin your product or process unless you

mix imagination with Alcoa Activated Aluminas

Water you can't remove is a sure bet to destroy the efficiency of a process or the quality of a product, or corrode the equipment. But you can count on drying up the last drop of unwanted water when you mix imagination and engineering with ALCOA® Activated Alumina. Here is the oldest, most thoroughly proved drying agent available. It makes possible dew points to minus 100°F and below. And because it can be saturated and reactivated almost endlessly without loss of capacity, it cuts drying costs substantially. See how quickly it can solve *your* dehydration problems. You'll join the thousands who've discovered it pays to *mix imagination with Alcoa Aluminas . . . to make a new product or process possible, an old product or process better.* To get product details, outline your desiccant application in a letter to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 709-L Alcoa Building, Pittsburgh 19, Pennsylvania.

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For exciting drama, watch "Alcoa Theatre," alternate Mondays, NBC-TV, and "Alcoa Presents," every Tuesday, ABC-TV

For finer products . . . let Alcoa add new dimension to your creative thinking

Because only Jenkins
gives you this 18 Point Protection
against valve repairs

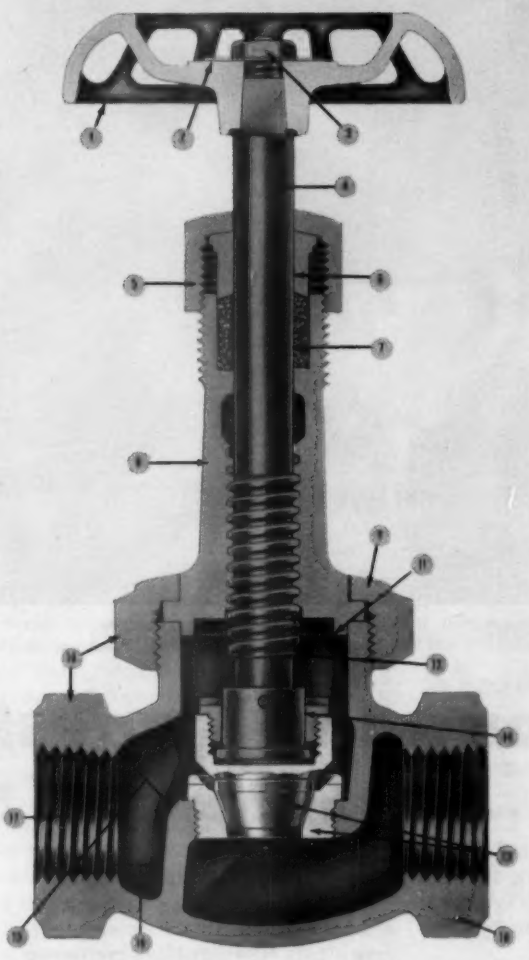
Specify JENKINS for PLUG TYPE Bronze Valves, too

THROTTLED STEAM with its destructive erosive effect on a valve seat . . . hard, seat-cutting substances like rust tubercles, boiler scale, pipe chips . . . such valve destroyers have little or no effect on a Jenkins Bronze Plug Type Valve. Jenkins 500 Brinnell Armor Seat defeats them.

There's much more to the durability of these valves than the seat. Jenkins gives you 17 *other* superior features that contribute to long-life and completely satisfying service. All are important to any valve user who wants maximum economy, and only Jenkins gives you all of them. Send for literature which gives full details about them.

Still more protection against valve repairs comes from superiorities which cannot be seen in any picture of a valve: The quality in the castings . . . the precision machining . . . the rigid inspection and testing which every Jenkins Diamond-marked valve undergoes.

You have many sound reasons for specifying Jenkins when the service calls for PLUG TYPE Bronze Valves. And you pay no premium for them. Write us or ask your Jenkins distributor for information folder.



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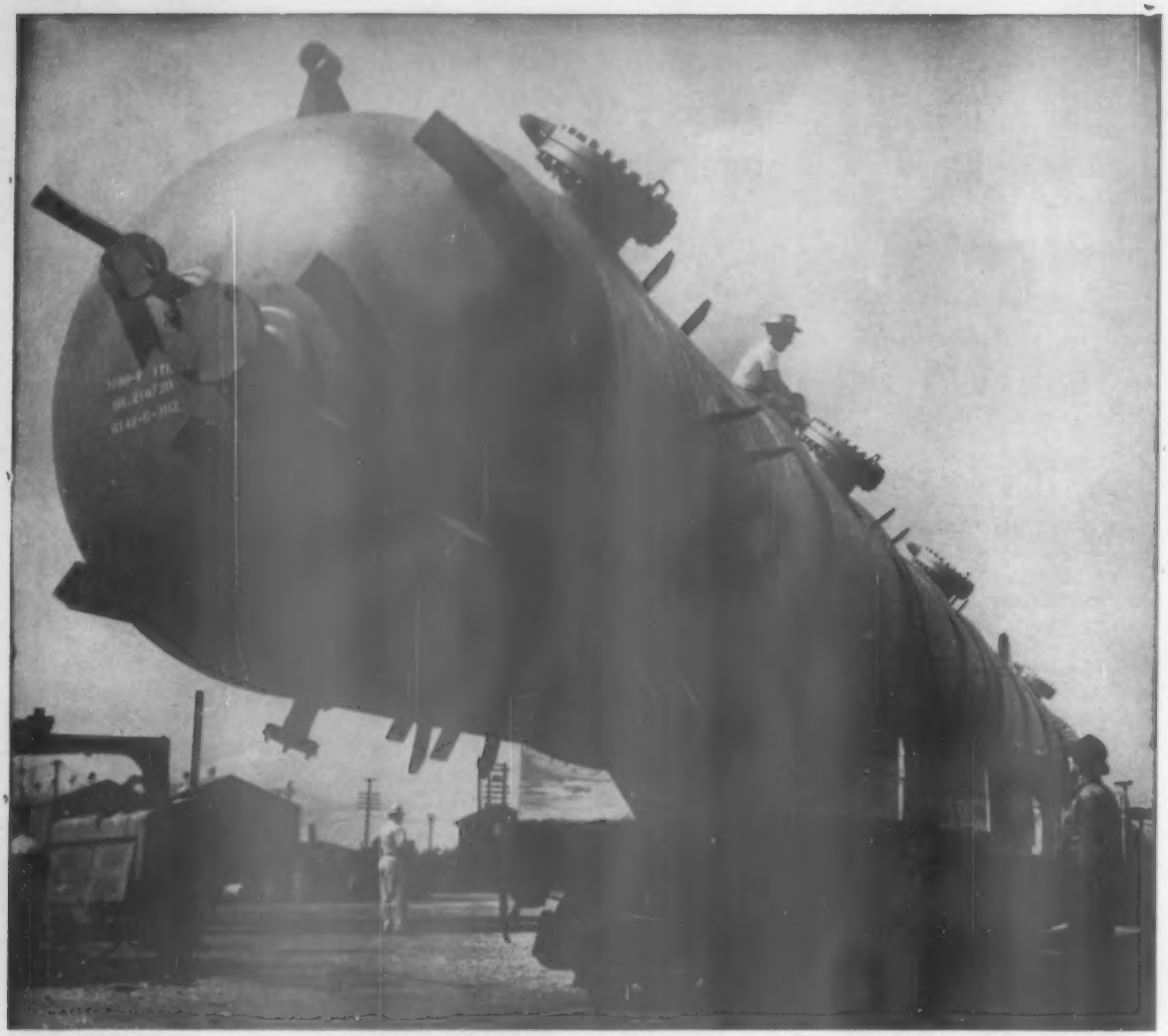

THIS ENTIRE VESSEL was radiographed. Built for use by Socony Mobil Oil Company, Incorporated, it was stress relieved in thirds, and the two joints were stress relieved locally. The unit contains 30 uniflex trays of 96" diameter. Overall weight: 152,000 lbs.

Among the largest in use

...built by Newport News

This Debutanizer with a 110 feet 6 inches over-all length is typical of units that are readily built by Newport News . . .

In fact, Newport News can fabricate almost any type of pressure vessel or other heavy equipment used in the petroleum, chemical or other processing industries.

But at Newport News you'll find more than large productive capacity.

In vast fabricating shops, in huge machine shops, foundries and forging plants, Newport News craftsmen complete your order with specialized techniques. Plant methods . . . developed as a result of specializing for more than half a century . . . enable Newport News to provide money-saving answers to all sorts of heavy equipment problems.

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This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

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SILICONE NEWS from Dow Corning

Down Foam and Up Production

IN PACKAGE DYEING

Job-Proved Dow Corning Silicone Defoamers Save Time, Material, Money

Foam may be fine in a brewery. But in most processing plants, it's a sign of inefficiency. Foam reduces production capacity, slows processing, increases waste — can skyrocket your costs way out of proportion. But why accept foam as a necessary evil when Dow Corning silicone defoamers are so readily available to knock out "bubble trouble" . . . quickly, easily and economically?

Imagine . . . just a few drops of a Dow Corning silicone defoamer is all it takes to control even the most violent and persistent foamers. And these versatile silicone defoamers neither alter nor contaminate products or processes. This permits you to use a Dow Corning defoamer wherever foam is a problem — in textile dyeing, papermaking and sizing; in refining, distilling and gas "scrubbing"; in food processing and packaging; in formulating paints, adhesives, pharmaceuticals . . . you name it.

No matter what you produce or process, you'll find Dow Corning silicone defoamers are economical; savings and production advantages are multiple. Prove this with your own tests using a generous trial sample that's yours for the asking. In writing for this free sample, please indicate your problem and mention the type of system—oil, aqueous, nonaqueous, food products, or any other. Address Dept. 2923 for a rapid reply.

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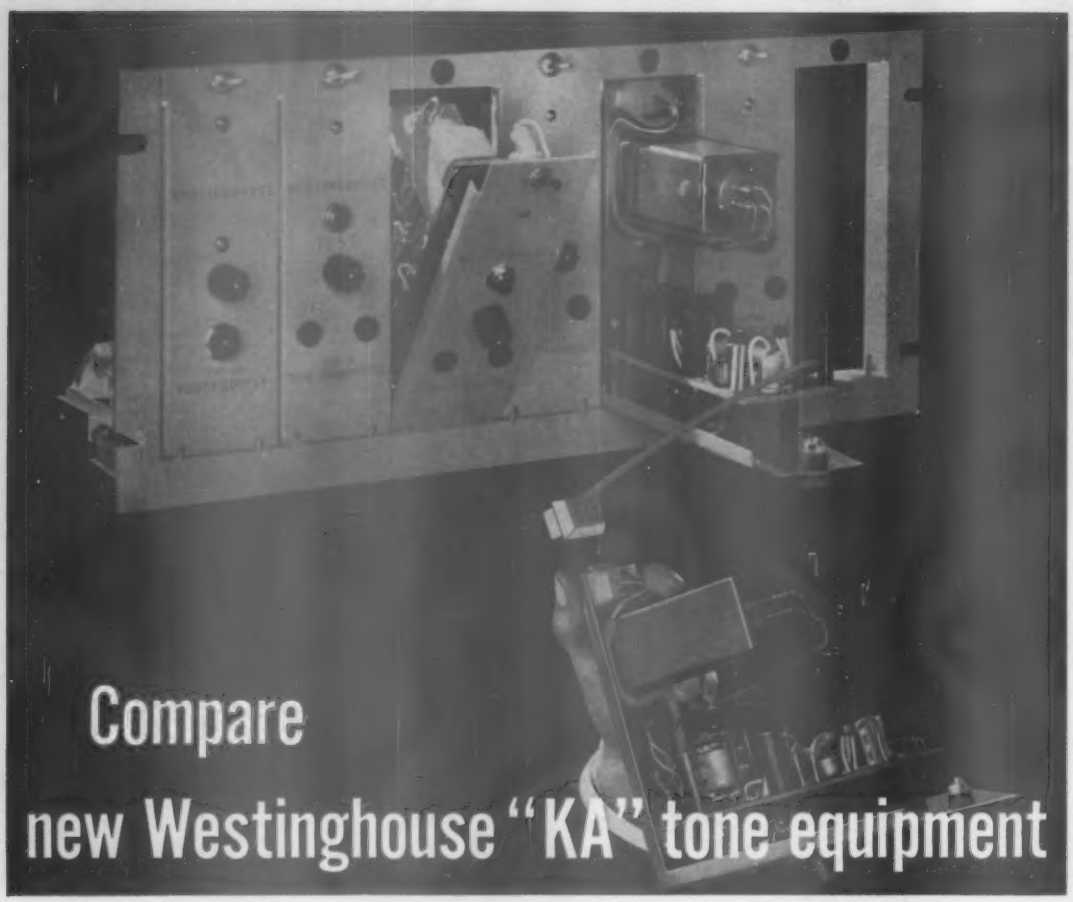

at $322 per channel, complete*

You can't afford not to compare value received in the new line of Westinghouse Type KA audio tone equipment . . . the optimum design considering performance and space factors at an average cost of only $322 per channel, for *all* equipment.

Using less than 1.6 rack space per channel, KA tone equipment will handle high speed teletype and high-speed data transmission. For example, up to 100 words per minute can be transmitted with 170-cycle channel spacing. Up to 18 channels can be provided over a single voice frequency circuit using wire lines, microwave radio or power line carrier.

Fully transistorized KA tone equipment is available for on-off control, impulse-type or frequency-type telemetering, supervisory or load control, teletype and other telegraphic-type functions—for remote indication, measurement, control or data transmission. Modular, self-supporting "flip-out" construction requires no rear access. This, plus elimination of tubes and availability of normal, routine check test points on fronts of panels, simplifies and reduces maintenance to an absolute minimum.

For full information on Type KA audio tone equipment, or other Communication and Control Products, contact your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-60985

*Actual per channel cost varies according to the number of channels per common frame and power supply. The $322 figure is an average per channel price. Actual prices vary from $343 to $300 per channel for 6 to 25 channels respectively.

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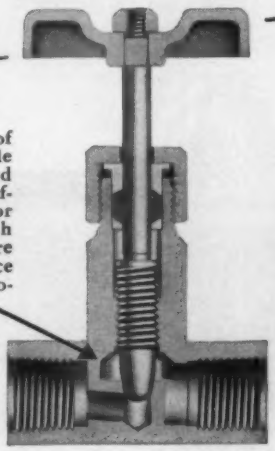
- Bodies marked in accordance with MSS regulations.



ONE PIECE

The stem guides of conventional needle valves are screwed into bodies—this often causes leakage or blow-outs. Marsh Needle Valves are fused into one-piece by exclusive "Conoweld" process.

The Ultimate in Needle Valves

Here is one of the crowning achievements of Marsh research, design, and manufacturing skill. It is the first needle throttling and shutoff valve to combine *all* of the qualities called for today in this highly critical and ever broadening field.

It is a valve that has strength and safety to spare . . . rated for pressures up to 10,000 psi—equally efficient in the lower ranges. A product of Marsh instrument-making and valve manufacturing experience, it combines instrument-like precision with the ruggedness that distinguishes all Marsh valve specialties.

The illustrations tell the story of new thinking; new standards. Body and stem-guide are machined from extra-heavy carbon steel bar stock. Still greater strength and rigidity are achieved by fusing the stem-guide into the body. The complete fusion of guide and body is accomplished by the exclusive Marsh "Conoweld" process.

There are two big advantages to this one-piece construction: (1) It eliminates the danger of unscrewing the valve from the body when opening—a frequent cause of leakage, even dangerous blow-outs (2) It permits perfect line-up of threads and seat. As a result, Marsh valves are easier to operate even at high pressures.

The precision-machined stem is 416 stainless steel. Stem threads are fine pitch for extra strength and fine, controlled regulation. Notable advancements are special "Marpak" one-piece, non-binding longer-lasting packing; deep thread chambers, keeping inlet and outlet piping away from ports and contributing excellent flow characteristics. Entire packing nut and packing gland are electro-zinc plated, preventing corrosion and giving the valve a handsome, plated exterior. The rugged malleable handle is finished in heavy baked enamel.

The new needle valve line includes globe and angle patterns with double female connections in sizes ⅛", ¼", ⅜", ½", ¾" and 1". Also globe and angle valves with male inlet and female outlet in sizes ¼" and ½". *Complete stock carried at our Skokie, Illinois factory and also at our branch plant in Houston, Texas.*

Write today for catalog giving complete details.

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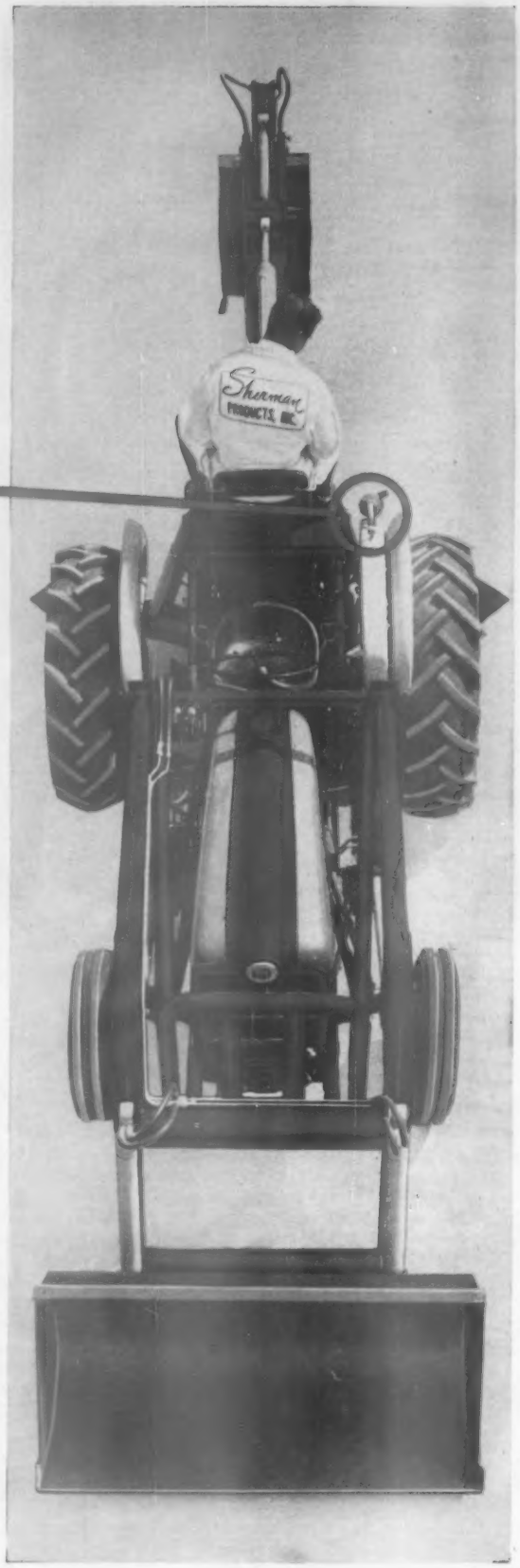

Only Sherman Power Diggers and Loaders Have the Easy-Check Filter Gauge!

Only the Sherman Digger and Loader have the easy-check filter gauge that guarantees positive hydraulic performance. Yes, now for the first time in the industry, all guesswork is eliminated! For the exclusive Sherman easy-check filter gauge tells you at a glance if your hydraulic filter is giving proper performance!

What does this exclusive Sherman development mean to you, the owner?

Better filtration means:

- **Longer equipment life!**
- **Less downtime!**
- **Fast filter cleaning without draining tank!**

In short, the exclusive Sherman filter gauge means—You Get More For Your Money When You Buy Sherman!

Write for details on *all* Sherman features or for filter gauge Bulletin No. 1597.

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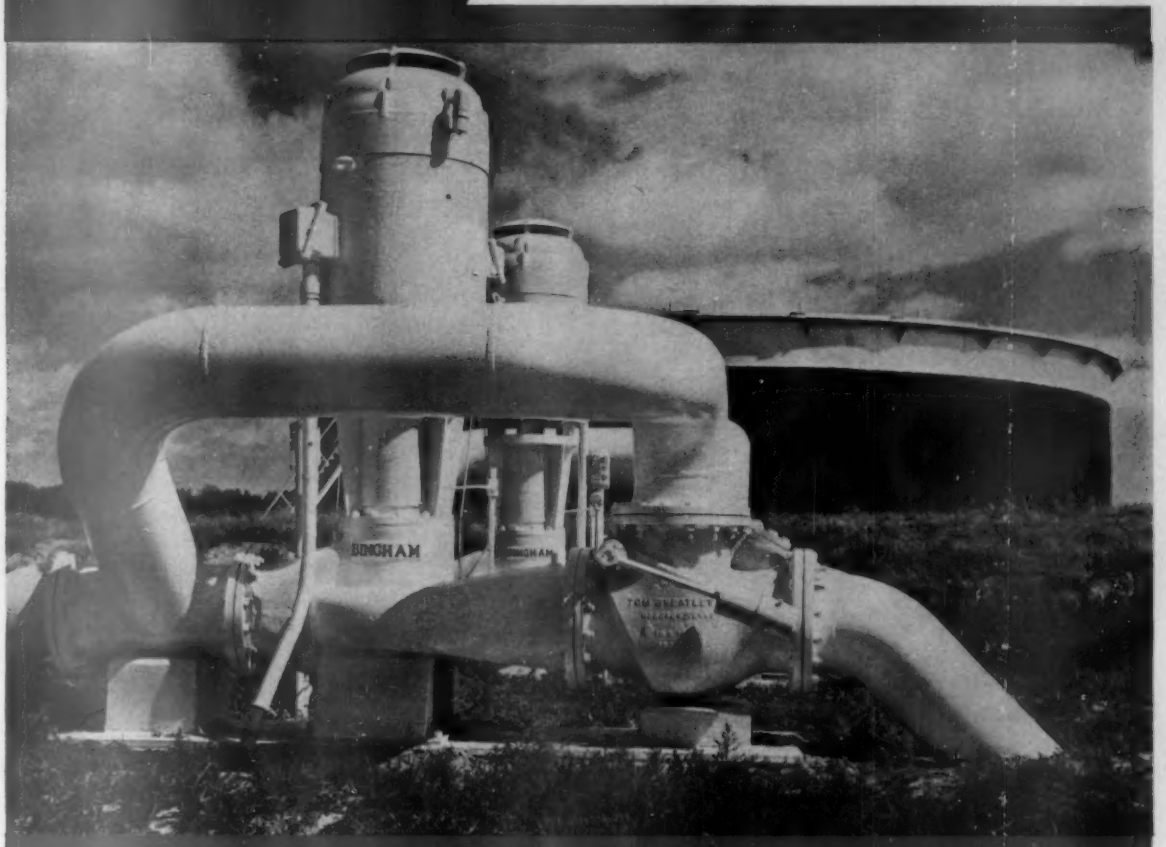
Bingham

TYPE "CVDS" VERTICAL "IN-LINE" PUMP

SPECIALLY DESIGNED FOR PIPELINE SERVICE



Typical installation of BINGHAM "IN-LINE" pumps on SERVICE PIPE LINE

The BINGHAM TYPE "CVDS" PUMP is an advanced design of the "Double Volute"-"Double Suction," single-stage pump, with the suction and discharge nozzles on the same vertical and horizontal center line, located 180° apart. These pumps are specially designed for pipelines —for booster, transfer, and tank unloading service, etc.

The "Double Volute" construction of the CVDS Pump maintains "Hydraulic Radial Balance" of the rotating element, eliminating "Side Push", which is the primary cause of wear and maintenance in conventional pumps. Also, this feature permits mechanical seals to establish and maintain uniform tract between the contacting faces, resulting in long seal life.

The "Double Suction" feature of this pump eliminates vertical hydraulic thrust, thereby permitting the use of *Standard Vertical Motors*. Also, this feature makes these pumps particularly suitable for low NPSH conditions.

Bingham SINCE 1921

DOUBLE VOLUTE PUMPS RADIAL BALANCE

BINGHAM PUMP COMPANY

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For Gathering Service

Here's the pipe with the spiral-lockseam structure that gives you light weight without sacrifice of strength. It's easy to handle and install. Provides extra safety because it's built to absorb shock loads, stresses and strains. Assures extra collapse strength, too. Diameters from 4″ to 30″. Pipe ends of standard weight thickness available. Write for Bulletin No. 59 or call our distributor.

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An economical, light weight conductor surface casing for rotary drilled wells in which the casing is to be cemented. Casing ends are made of heavy steel plate, either threaded accurately to A.P.I. standards or plain for slip joint field welding. Store stocks are carried in 30 foot lengths for threaded casing or 40 foot lengths for slip joint casing. Write for details or ask our distributor.

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and still no overhaul

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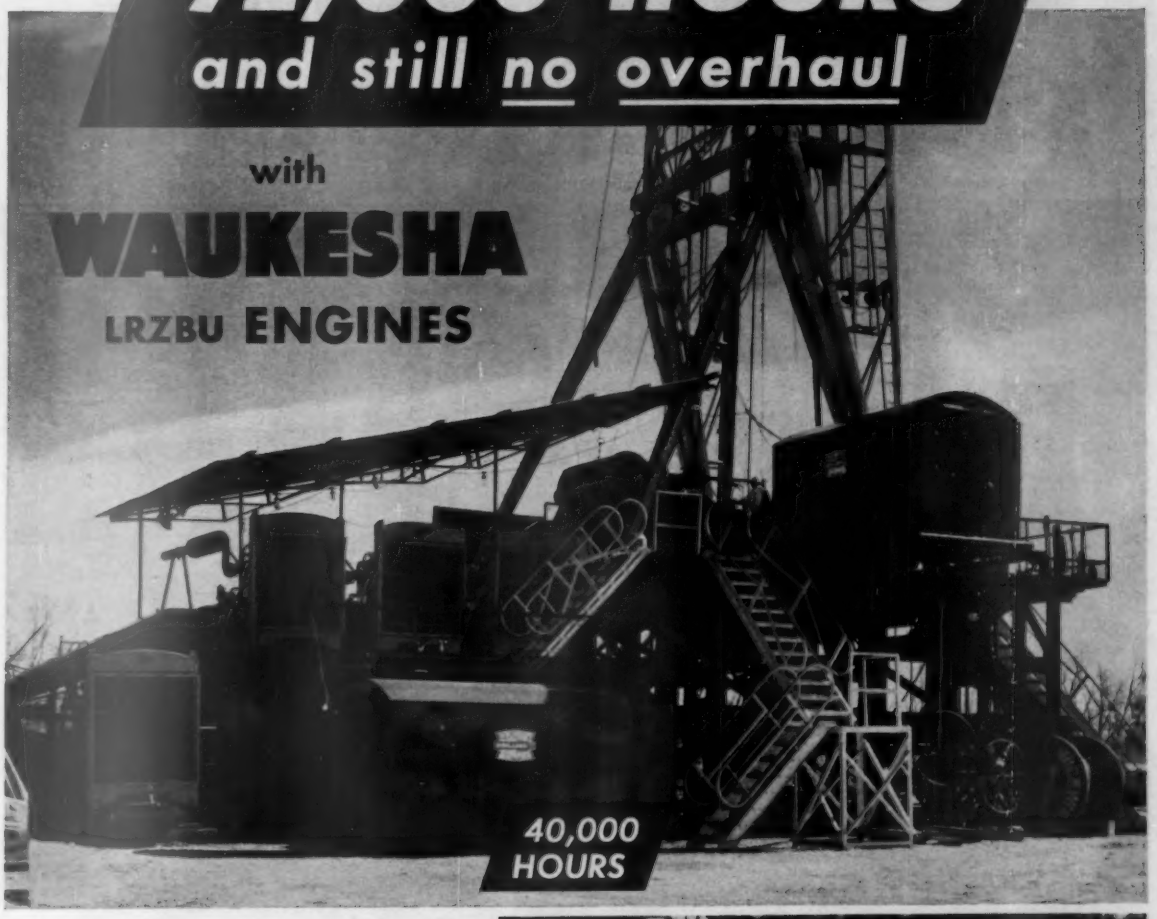
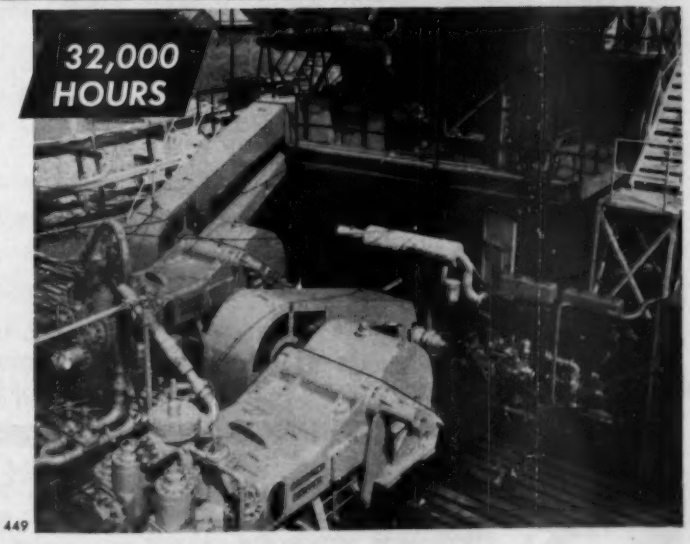
LRZBU ENGINES



Two FRED WILSON DRILLING CO. rigs shown operate in southern Louisiana. Rig 12 has four and Rig 9 has three Waukesha gas power units, Model LRZBU, six cyl., 9⅜-in. bore x 8½-in. stroke, 3520 cu. in. displ. Rig 12 (above) has 40,000 hours service; Rig 9 (right) 32,000 hours. No engine has had any overhaul, and practically no repairs, reports Mr. Fred Wilson . . . these are just some reasons why his equipment is 100% Waukesha powered. He operates six rigs (two each of National 110, 80B and 55 sizes) and sixteen Waukesha LRZBU; three LRO; one each NKU, WAKU, 145-GKU; and several XAHU power units. Send for Bulletins.



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WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN / New York • Tulsa • Los Angeles
Factories at Waukesha, Wisconsin and Clinton, Iowa

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AMERICAN IRON Straight Grip tool joints are *three times* as strong as the pipe they connect! You'll like the quick, easy way this hand applied Straight Grip can be removed and installed right at the rig. STRAIGHT GRIP tool joints are ideal for handling high tensile drill pipe.

These are just a few of the reasons why you buy quality when you specify AMERICAN IRON.

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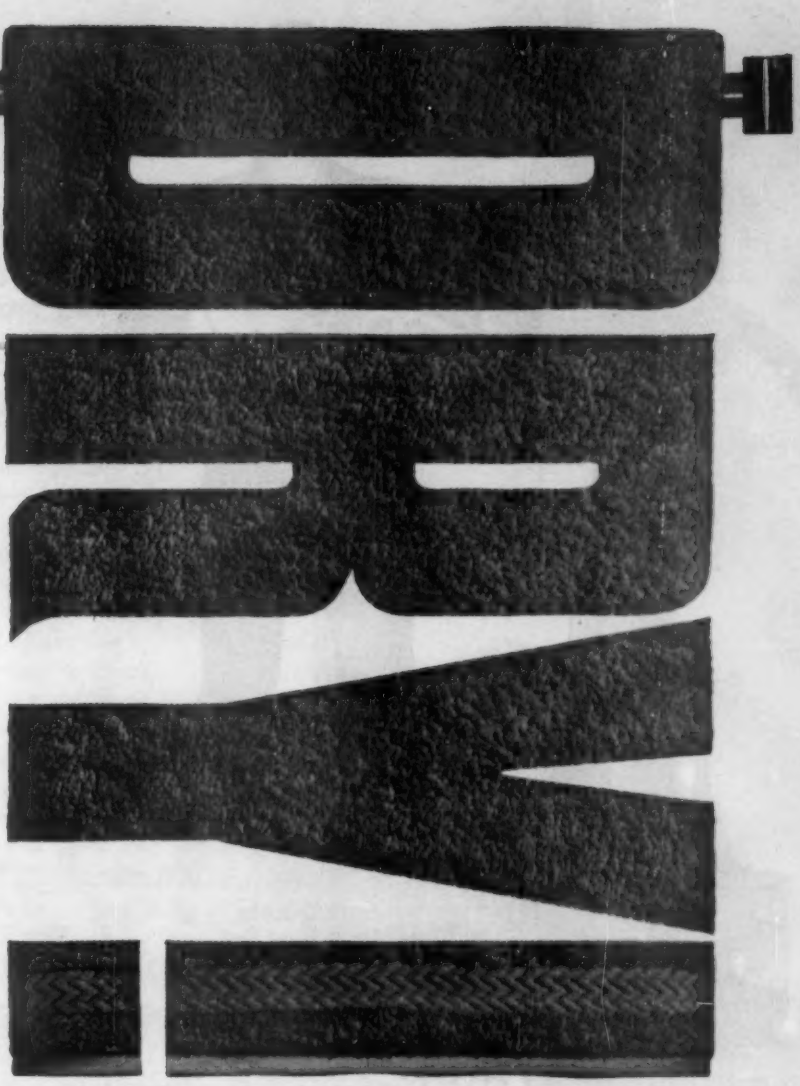
DAVISON

When gases must be



Davison Hi-Sorb Silica Gel dries better

That's why Davison Silica Gel is so often to be found in natural gas dehydrators . . . in gas streams . . . in the refinery. Davison Silica Gel prevents hydrate formation which clogs lines, causes high-pressure losses and high maintenance costs. It decreases corrosion in equipment and reduces power costs in compression. Not least—it keeps customers happy! There's nothing better obtainable. Write Dept. 31111 today for full information.

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DAVISON CHEMICAL DIVISION

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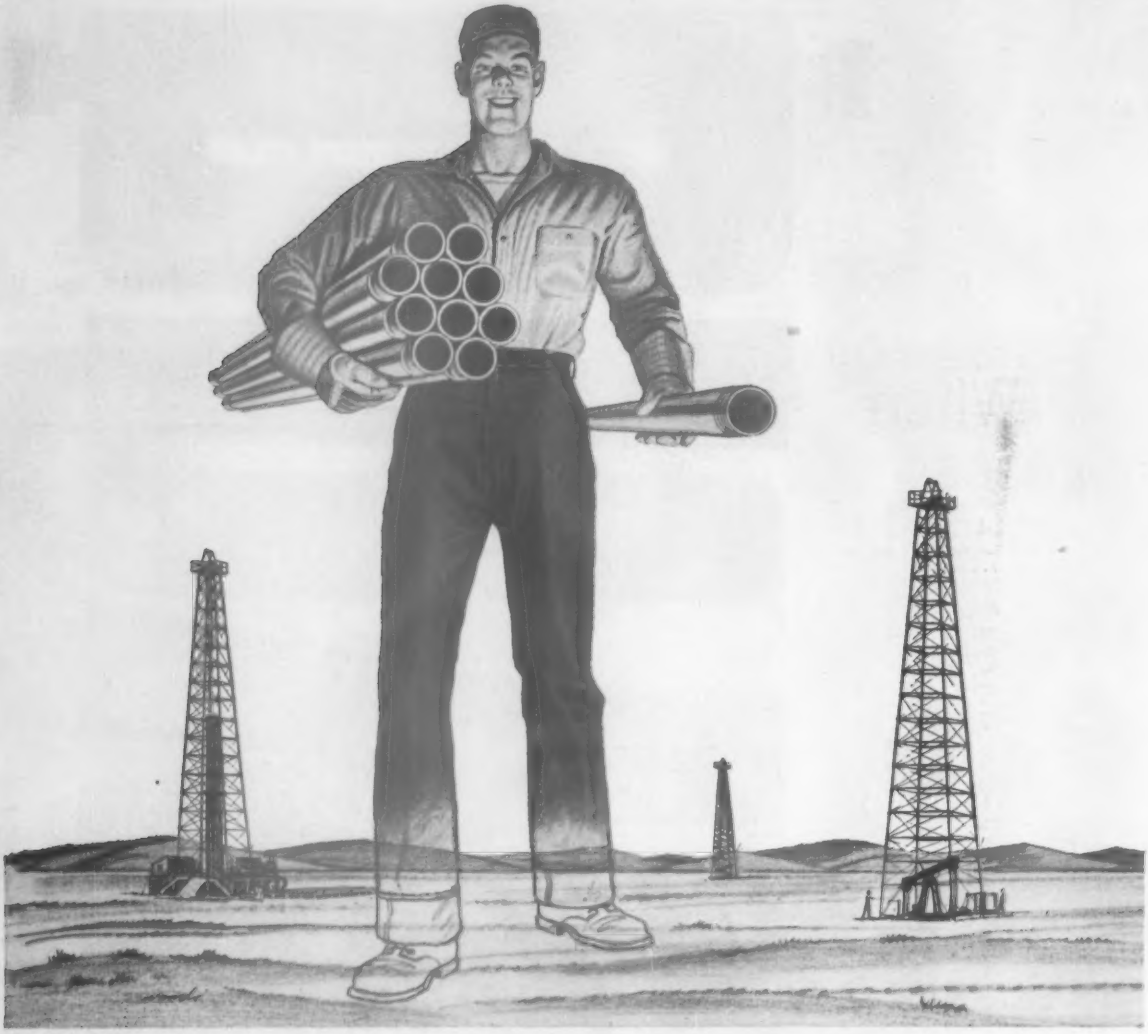

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The CF&I giant stands for skill and long years of experience in producing quality steel products. And in the petroleum industry, users have learned to rely on CF&I's craftsmanship for straight, strong and "true" seamless casing and tubing.

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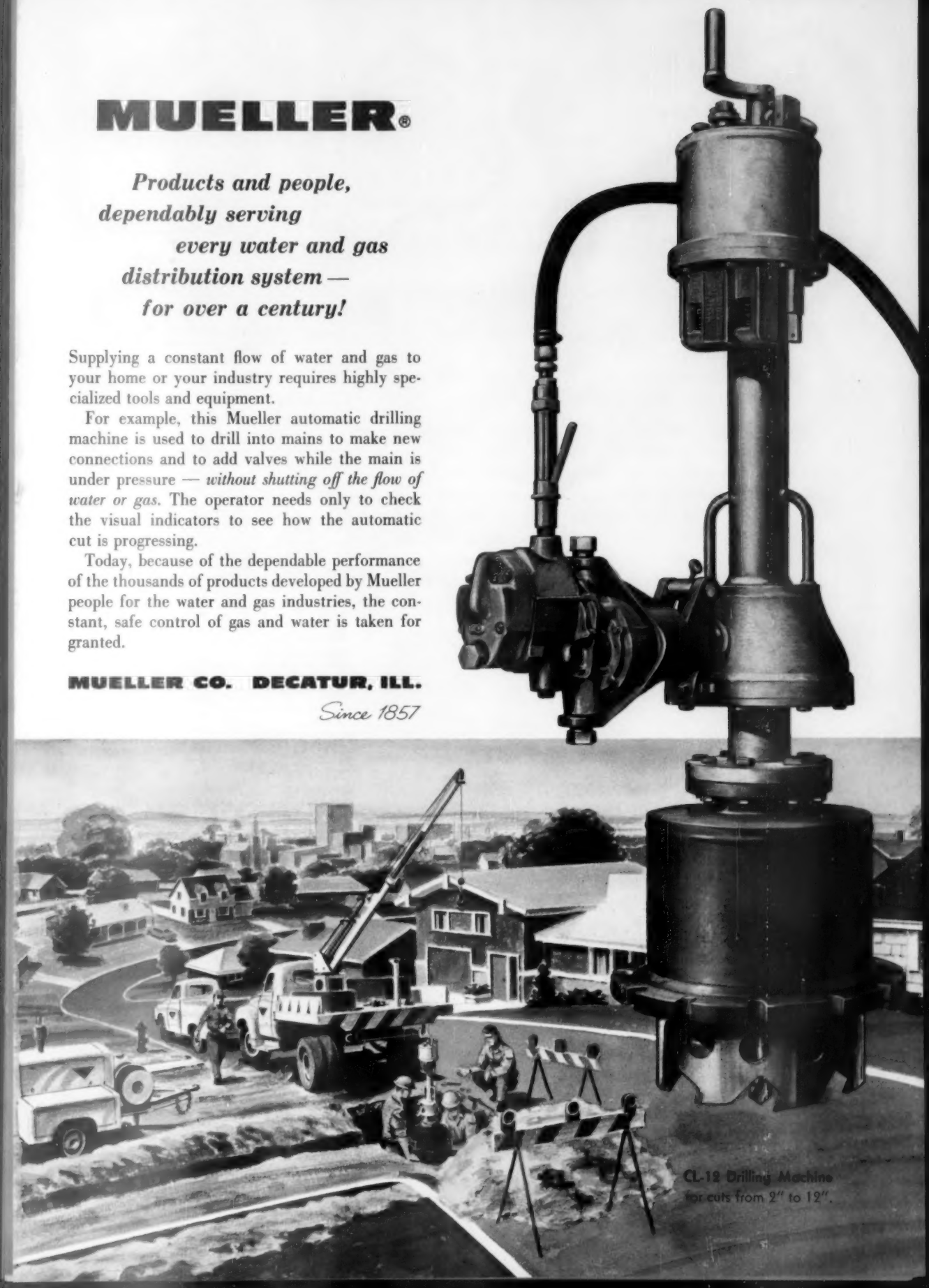

CL-12 Drilling Machine for cuts from 2" to 12".

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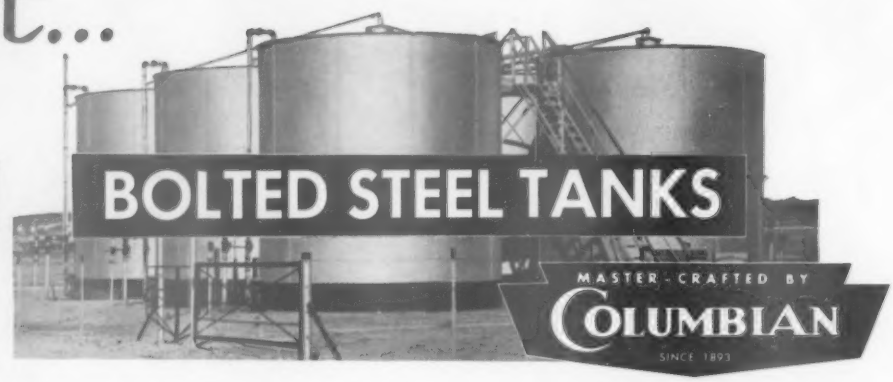

The first Columbian Bolted Steel Tanks (and they were the first built anywhere!) were built to last!

Today's Columbian Master-Crafted tanks are built to last, too — even better! They are everything that long-established, careful craftsmanship has always assured — *plus* all that modern research has developed to make them *set up* easier, *fit up* better, *stay tight* longer! You can save both time and money when you need a tank or tanks by getting in touch with your nearest Columbian distributor for the Bolted Steel Tanks that are *Master-Crafted!*

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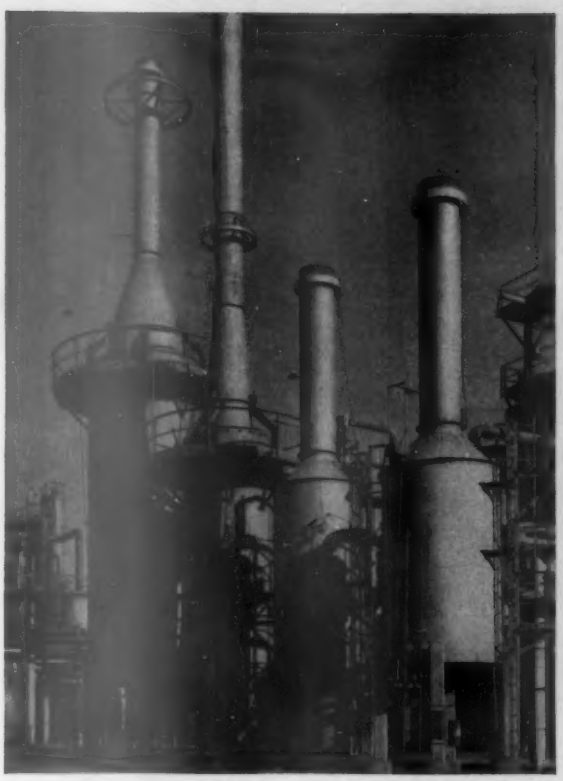

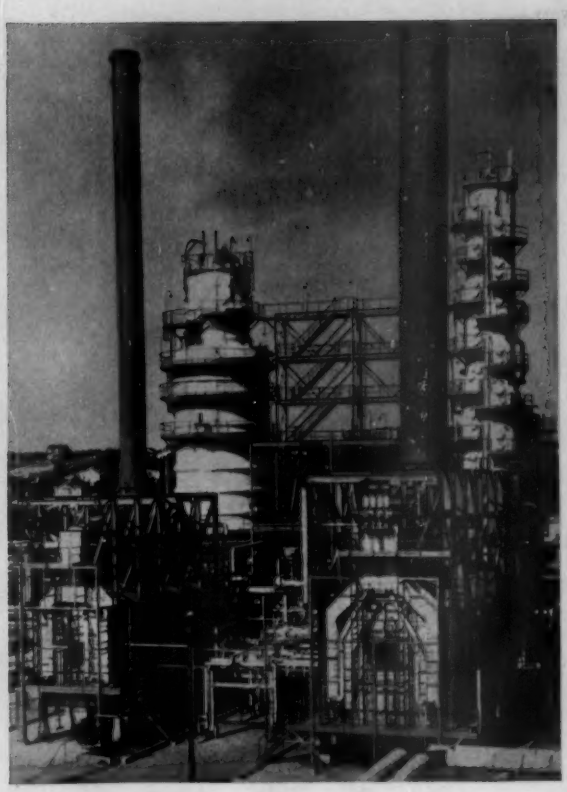

Foster Wheeler Heaters . . . Different two important ways

Is there really a difference between direct-fired heaters today? The answer is in the story behind the product.

FW built the first modern direct-fired radiant heater some 40 years ago. As refineries and process plants became larger and more complex, FW engineers designed and developed improved heaters for them. The products of this pioneering make up the large selection of modern vertical and horizontal heater designs offered by FW to the process industry today.

And while this wealth of experience is an important difference, there is more than experience alone in the service "package" that goes with FW direct-fired heaters.

This second difference is specialized Heat Engineering . . . FW's way of integrating the heater into the overall process scheme. FW engineers give their heaters the flexibility to meet exacting process requirements. They have demonstrated that whether a single heater is rated at 500,000 or 340,000,000 Btu/hr capacity, there is no need to restrict the ultimate selection with a static product or fixed design. Each FW heater is individually tailored to "your" process.

The result is an efficient, dependable heater . . . a significant contribution to a smooth running and profitable process installation.

To get in touch with FW engineers who can survey your process heating requirements, write to Foster Wheeler Corporation, Department A, 666 Fifth Avenue, New York 19, New York.

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imagination set his course

Black seas, starless skies . . .
no charts or maps to guide him.
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And a New World was added to the Old.

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From natural gas and oil . . . heat, power, petrochemicals that mean ever wider service to man.

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Fast help on corrosion control—A big Texas natural gas plant required periodic analyses to determine whether MEA solution was breaking down in regeneration, forming corrosive salts. Samples were being sent out of state for analysis, "took forever" to get results. Enter Allied. Now tests are run in Dallas, results come back *fast*, help this plant prevent corrosion before it can start.

New plant start-up trouble quickly traced—Slug of distillate filled inlet scrubber, carried over to amine system. Aqueous amine solution thoroughly contaminated with hydrocarbon. Customer shut down plant, was going to dump entire charge. Allied specialists diagnosed trouble as too rich amine concentration, then suggested decanting solution into empty tanks, which saved half of charge.

Foaming in glycol plant—Customer wanted to know what caused it, how to stop it. Allied specialists flew to the site, deduced cause of the trouble in a matter of hours. Lab analysis confirmed their findings. In a recommendation just five typewritten lines long, they told customer how to solve the problem completely, economically.

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They Say—

Don't kid yourself

"Most of the tools of production used by foreign competitors are every bit as good as ours, and in many cases even better.

"To make matters worse, our corporation tax policy is making it increasingly difficult for industry to lay aside enough money to replace obsolete equipment.

"There's no use kidding ourselves—we no longer are riding high, wide and handsome, at the head of the world procession.

"Our once tremendous tool advantage is vanishing.

"If we are to maintain job security, we must produce more goods per dollar of payroll.

"This doesn't mean that wages cannot rise—it simply means that we must earn them by increased output per man dollar."

Editorial in the October issue of "Cities Service Empire," magazine of Cities Service Oil Co.

It can be done

"Accidents can be reduced by adequate management and operating policies and procedures.

"Last year our accident frequency rate was 2.66 per million hours worked. The over-all rate of the 255 oil companies in the National Safety Council contest was three times as high as the General Petroleum experience."

R. E. Lauterbach, vice president and director of manufacturing, General Petroleum Corp., in a speech to the National Safety Council, Chicago.

Good advice

"Congress would do well to heed the advice of William J. Murray, Texas Railroad commissioner, who appeared before one of its committees recently.

"Deploring attacks by members of Congress on the Interstate Oil Compact and conservation methods of the oil states, Murray urged an end to federal meddling in these fields.

"Adverse tax provisions or restrictions on markets, he showed, could have a serious impact on the development of new oil and gas resources. Eventually such actions would pro-

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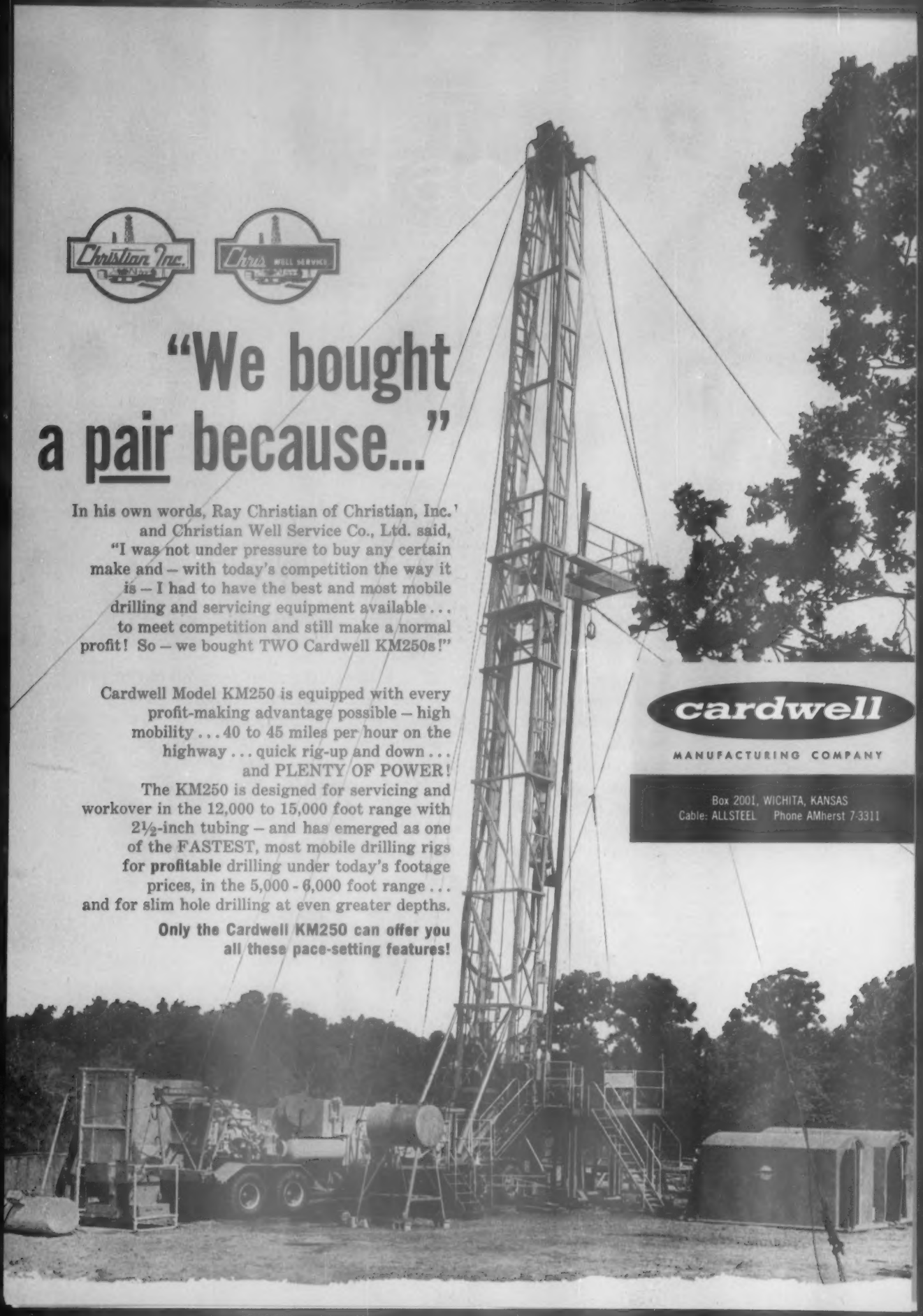
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duce scarcities and raise prices to consumers.

"That likely will be the effect of the court-imposed regulation of the price of natural gas at the wells unless Congress acts to undo the court decision."

Editorial in the Dallas Morning News.

Six-word summary

"Ada's W. A. (Gus) Delaney, Jr., has offered a $250 prize for the best 50-word statement outlining the benefits to be derived from an Oklahoma constitutional amendment setting a minimum 50-bbl. per day oil allowable.

"Anyone with an empty head and a dollar may join in this movement. We aren't moved, but 250 bucks is 250 bucks, and we've been trying to come up with a winner. So far we've been unable to stretch it out for more than six words, to-wit: 'It would be good for Gus.'

"Who could drill, or even afford to produce, the thousands of stripper wells in southeast Kansas, if eastern Oklahoma producers went mad drilling 50-bbl. quickies? How long would a deep well in southwestern Kansas be economical when the market was diluted by thousands of 50-bbl. strippers?

"If Oklahoma, which is on its way to lose a court test of an action forcing a purchaser to buy oil, ever gets that kind of a law on the books, it is finished. So is Kansas, which would be hit first."

From "Oil Briefs" column in the Wichita Beacon.

Crazy as an oil man

"It used to be taken for granted that if you found oil you were automatically rich—and not just rich but good and rich—Texas rich.

"Oil in the popular mind is still a fabulous thing—it isn't oil, it's 'black gold,' and it doesn't come from quiet little wells, averaging here in Texas only 14 bbl. per day, but from great 'gushers' which last forever.

"Dry holes, in the public mind, are still unlikely and implausible, and probably due to incomprehensive stupidity, mismanagement, or downright dishonesty on the part of the people drilling the well.

"With all our modern refinements, gadgets, and much-touted geophysics, many laymen believe there simply is no excuse for drilling a dry hole—there must be fraud somewhere along the line.

"Now if drilling wildcat discovery

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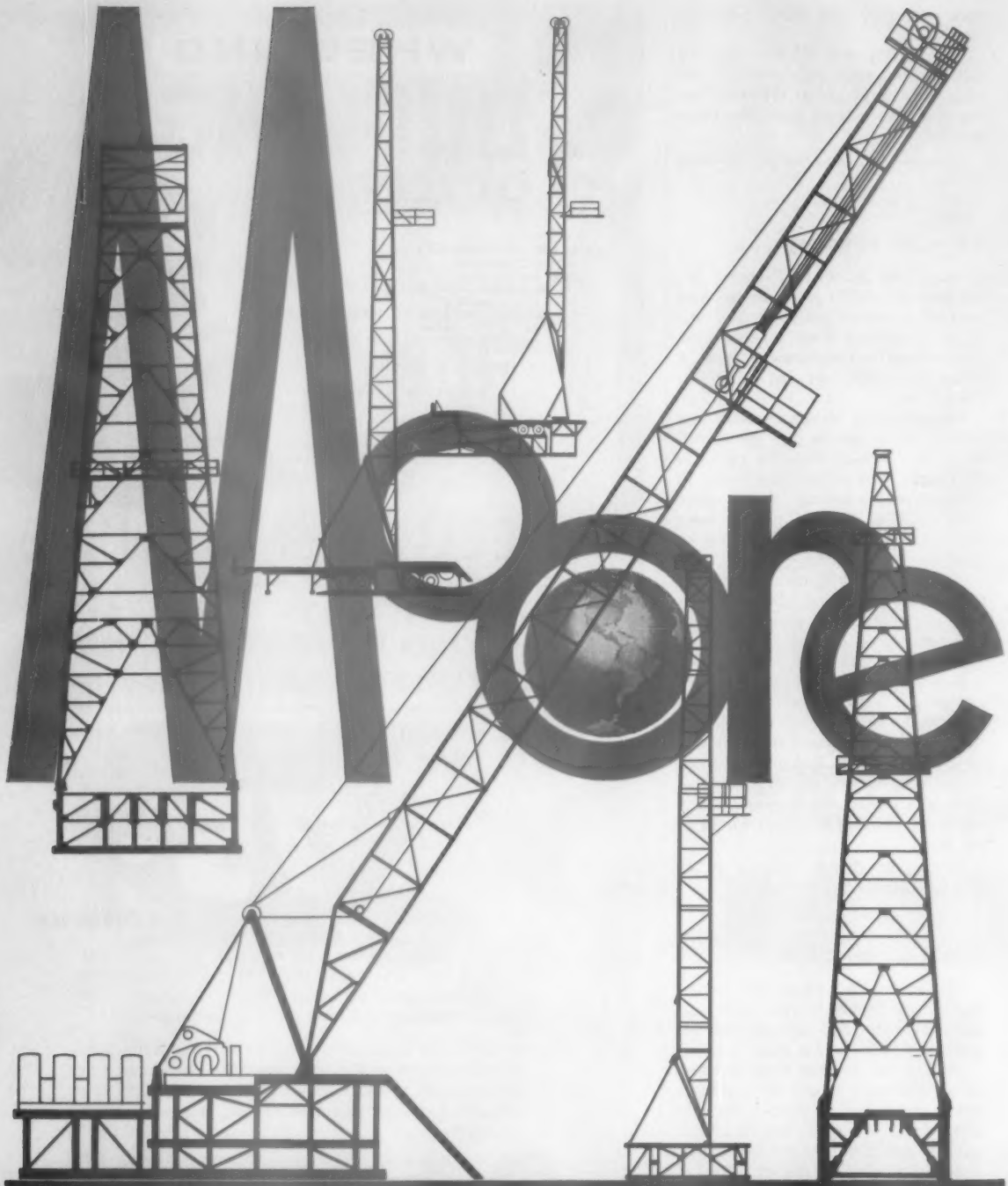

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wells were as easy and automatic as the consuming public believes, we would indeed be just as rich as the public believes—except that oil would be selling for pennies instead of dollars.

"And if dry holes were the result of bungling or chicanery, just about every oil man in the business would qualify for either a mental or a penal institution. My own record would certainly entitle me to perpetual, if not loving, care at government expense."

Frank B. Conselman, consulting geologist, Abilene, Tex., in a speech to the Association of Desk and Derrick Clubs of North America.

Begin at pump island

"Each of you probably has his own ideas on how we should go about winning the public's confidence, understanding and approval. The best way to do this, as I see it, is for our industry to bend every effort to augment and assure the prosperity of our dealers.

"We desperately need retail outlets that are well selected, well manned, and well maintained, so that they will be regarded as assets to their communities. After all, pump island public relations is what makes us or breaks us in our business."

George D. McDaniel, Mobil Oil Co., in a speech to the West Virginia Petroleum Association.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

NOVEMBER

16-20 Fifth International Automation Congress and Exposition, New York Trade Show Building, New York.

17-18 Natural Gas Pipe Line Institute, new Seward County Courthouse, Liberal, Kans.

19 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

20 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

20 Appalachian Geological Society, technical meeting, Charleston, W. Va.

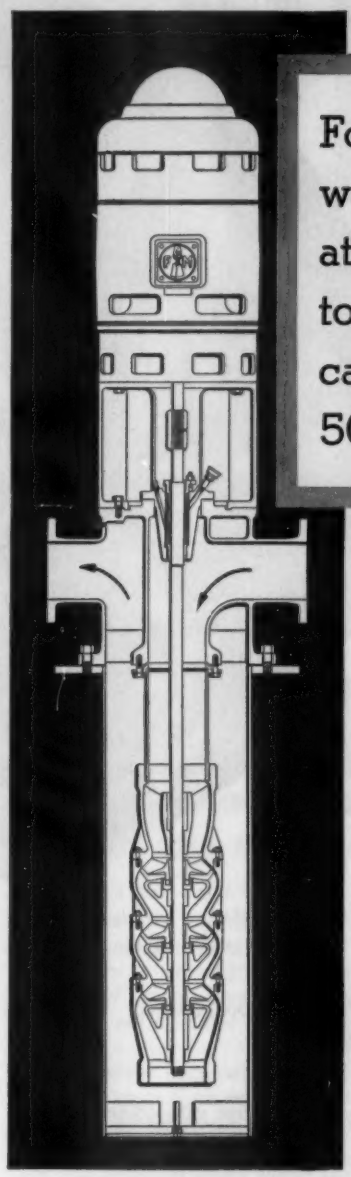
22-29 Third Venezuelan Geological Congress, sponsored by Venezuelan Society of Geologists and Venezuelan Ministry of Mines and Hydrocarbons, Caracas.

29-Dec. 4 American Society of Mechanical Engineers, annual meeting, Chalfonte Haddon Hall, Atlantic City, N. J.

DECEMBER

1-2 Western Petroleum Refiners Associa-

NEW Fairbanks-Morse Inverted Pot-Type Turbine Injection Pump



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Installations may be single or in series, depending on specific components selected for head capacity requirements. Power may be F-M direct electric drive, or right-angle drive with F-M motor or O-P diesel.

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tion, second computer conference, Hotel Tulsa, Tulsa.

3 Southern Gas Association, transmission section, round table conference on construction cost estimates, Sheraton-Dallas Hotel, Dallas.

4 Southern Gas Association, transmission section, round table conference on pipeline engineering, Sheraton-Dallas Hotel, Dallas.

3-5 Interstate Oil Compact Commission, annual meeting, Sheraton Hotel, Philadelphia.

3-5 American Chemical Society, southwest regional meeting, Baton Rouge, La.

6-9 American Institute of Chemical Engineers, annual meeting, Sheraton Palace Hotel, San Francisco.

11-15 Society of Automotive Engineers, meeting, Sheraton-Cadillac and Statler hotels, Detroit.

JANUARY

22 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

25-28 Plant Maintenance and Engineering Show, produced by Clapp & Poliak, Inc., Convention Hall, Philadelphia.

31-Feb. 3 Pipe Line Contractors Association, annual meeting, Ambassador Hotel, Los Angeles.

FEBRUARY

1-5 Instrument Society of America, instrument-automation conference and exhibit, Houston Coliseum, Houston.

8 Alberta Division of Canadian Petroleum Association, annual meeting, Hotel Palliser, Calgary.

8-10 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Billings, Mont.

14-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Statler-Hilton and McAlpin hotels, New York.

21-24 American Institute of Chemical Engineers, meeting, Biltmore Hotel, Atlanta.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

MARCH

2-4 American Petroleum Institute, Division of Production, southwestern district meeting, Statler-Hilton Hotel Dallas.

7 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.

14-18 National Association of Corrosion Engineers, sixteenth annual meeting, Memorial Auditorium, Dallas.

16-18 American Petroleum Institute, Division of Production, southern district meeting, Hilton Hotel, San Antonio.

18 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

21-23 Midwest Gas Association, annual meeting, Hotel St. Paul, St. Paul.

24-25 New England Gas Association, annual meeting, Hotel Statler-Hilton, Boston.

28-30 Western Petroleum Refiners Association forty-eighth annual meeting, Hilton Hotel, San Antonio, Tex.

30-Apr. 1 American Petroleum Institute, Division of Production, Mid-Continent

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district meeting, Broadview Hotel, Wichita.

APRIL

- 3-8 Engineers Joint Council, sixth nuclear congress, New York.
- 4-7 Oil Heat Institute of America, annual convention, Park-Sheraton Hotel, New York.
- 4-7 National oil heat and air-conditioning exposition, Coliseum, New York.
- 5-7 Instrument Society of America, national chemical and petroleum instrumentation symposium, Rochester, N. Y.
- 12-14 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, conference and exhibition, Municipal Auditorium, Kansas City.
- 19-21 University of Oklahoma, College of Engineering, southwestern gas measurement short course, north campus, University of Oklahoma, Norman.
- 20-22 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.
- 20-22 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.
- 21-23 Society of Economic Paleontologists and Mineralogists, Permian basin section annual meeting and field trip, Abilene, Tex.
- 24-26 Independent Petroleum Association of America, midyear meeting, Denver Hilton Hotel, Denver.
- 25-27 Southern Gas Association, convention, Buccaneer and Galvez hotels, Galveston.
- 25-28 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
- 25-29 American Welding Society, annual meeting and welding exposition, Los Angeles.
- 27-29 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.
- 28-29 American Petroleum Institute, Division of Transportation, pipeline conference, Mayo Hotel, Tulsa.

MAY

- 1-4 American Petroleum Institute, Division of Transportation, tanker conference, Seaview Country Club, Absecon, N. J.
- 2-3 Society of Petroleum Engineers of AIME, North Texas section, fourth biennial secondary recovery symposium, Wichita Falls, Tex.
- 5-6 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual joint meeting of Rocky Mountain petroleum sections, Calgary.
- 9-11 Instrument Society of America, power instrumentation symposium, San Francisco.
- 9-12 American Petroleum Institute, Division of Refining, midyear meeting, Statler and Sheraton-Cadillac hotels, Detroit.
- 12-13 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.
- 18-20 American Petroleum Institute, Division of Marketing, midyear meeting, Statler-Hilton Hotel, Cleveland.
- 25-28 American Association of Petroleum Geologists, western Canada regional meeting, Banff Springs Hotel, Banff, Alta.

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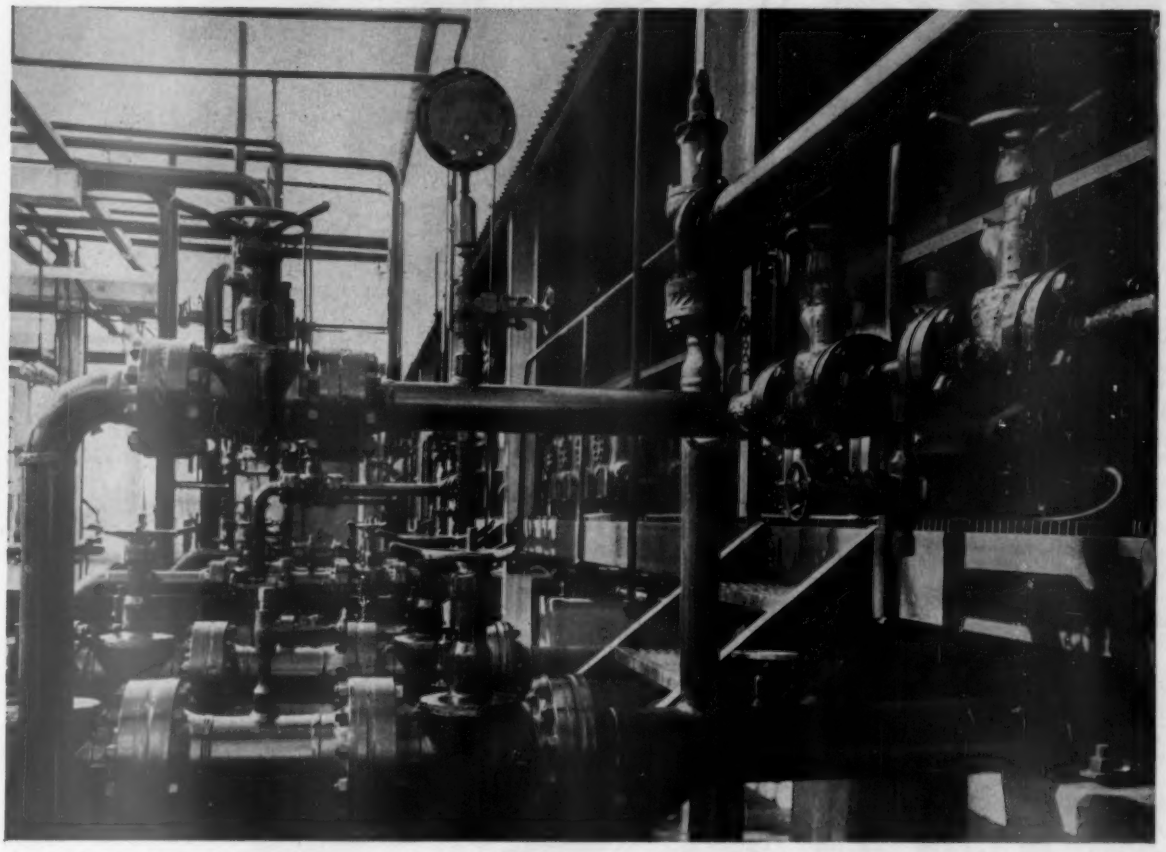

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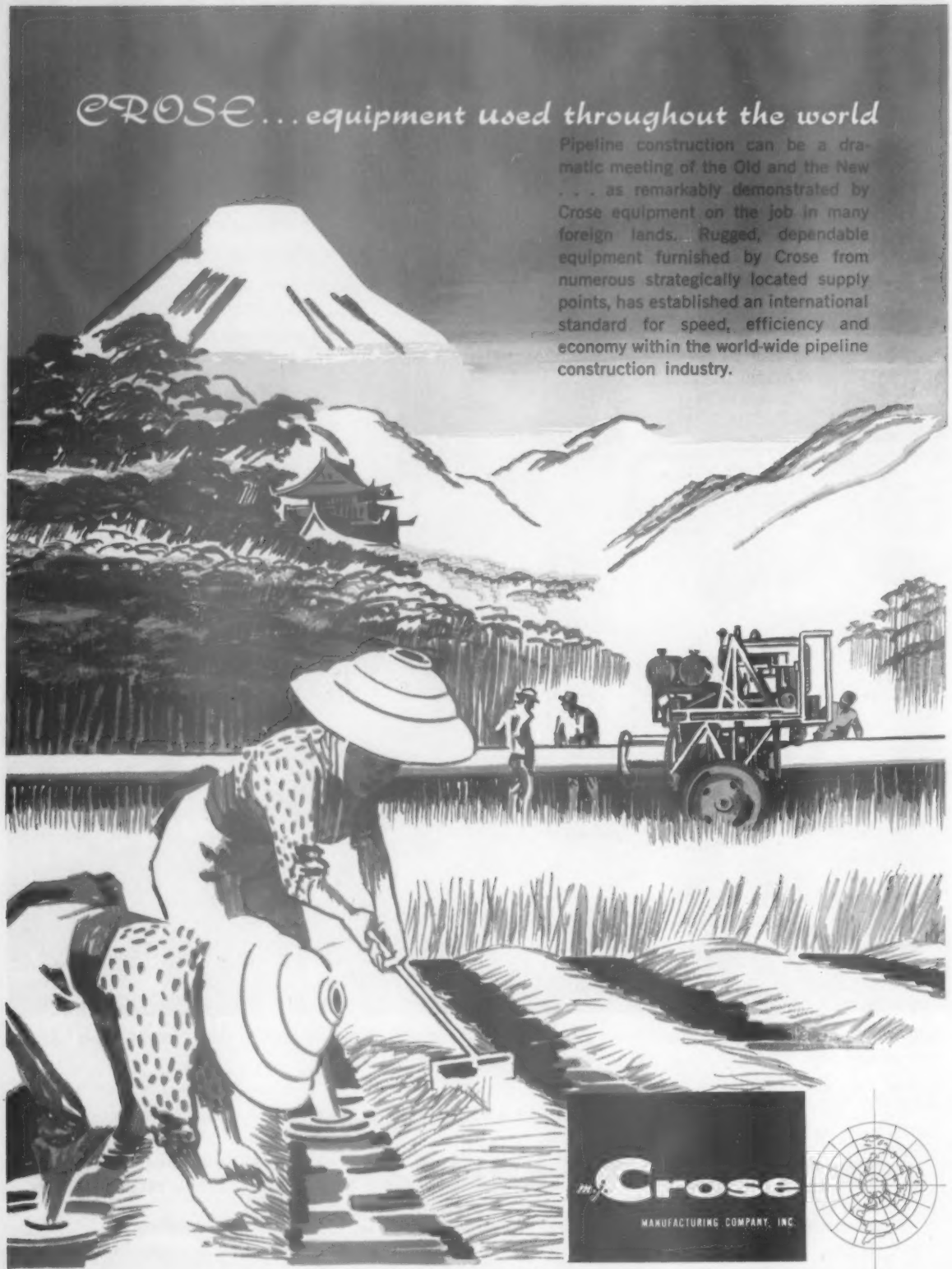
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50 years ago

November 20, 1909

Heavy rains end prolonged drouth which forced virtually complete shutdown of drilling in many areas of Oklahoma. Ample water is provided in streams, ponds, and wells for resumption of operations.

Glen T. Braden, owner of extensive Oklahoma gas properties, and group of St. Louis industrialists, organize St. Louis Gas Light, Heat & Power Co. with proposal to lay pipeline from Oklahoma to supply St. Louis with natural gas.

First pipe arrives for 8-in. oil line Standard Oil Co.'s newly chartered Oklahoma Pipe Line Co. will lay from Glenn pool, south of Tulsa, to connect with line Standard Oil Co. of Louisiana is laying from North Louisiana to Baton Rouge.

25 years ago

November 15, 1934

Harrison & Abercrombie, Houston independent operators, bring in their 1 Bernard River discovery well on the large Old Ocean prospect in western Brazoria County, Texas Gulf Coast. Major oil and gas-condensate producing area is indicated. Completion in 8,600-ft. Frio sand makes this the third-deepest producer on Gulf Coast.

Federal control of oil production becomes paramount subject facing fifteenth annual meeting of the American Petroleum Institute at Dallas this week.

Michigan oil production of 8,914,184 bbl. for first 10 months of 1934 sets new record more than 1,000,000 bbl. above production of whole record-producing year of 1933.

10 years ago

November 17, 1949

U. S. Geological Survey embarks on biggest oil-geology study in history. More than 70 geologists, in concerted effort, engage in intensive investigations covering 22 states and Alaska to delimit areas favorable for occurrence of petroleum and natural gas.

Group of four large natural-gasoline manufacturers headed by Chicago Corp. take over oil-refining and pipeline properties of Atlas Oil & Refining Corp. at Shreveport. Move marks new trend on part of natural-gas processors toward use of refinery processes and equipment to upgrade their products.

JOURNALLY SPEAKING

Association Put and Take

WHEN we were a fraternity pledge, the upperclassmen kept hammering us with the slogan: "You get out of an organization only as much as you put into it."

We thought of that the other day on reading that Union Oil Co. of California is withdrawing from membership in the API and other industry associations, and is advising its employes to do the same.

Union's stated reason was that it isn't getting enough out of association activity to make it worth while. So we began to wonder just what Union has been putting into these organizations —and just what it expected to get out of them.

For that matter, what does any oil company or oil man put into and take out of an association?

On the put side it is easy to add up the dues money and travel expenses. But you can't hang a dollar sign on the take side.

Some men, we suppose, join trade associations just to be good fellows because some friend asked them to join. Others, perhaps, simply to have the moral satisfaction of helping along a good cause, like a contribution to charity.

Such people, presumably, received their full compensation when they paid their dues. Association membership is a way of life in American business, and if an association is doing something to improve conditions in the industry, or a segment of it, it should be supported.

Others seem to get their money's worth out of just going to meetings and enjoying the social activities and fraternization. That's all right, too, because it helps to know other people in the business, and some valuable contacts can be made at such gatherings.

But others, apparently including Union Oil, want something more specific out of their memberships. They would like to have their associations grapple firsthand with the most pressing industry problems of the day and point to some solutions that they can apply to their own businesses.

And are they getting that? We have to say that in all too many instances they aren't. Our staff members attend a great many oil and gas industry meetings of all sorts, and many times in recent months they have come back and reported:

"Nothing happened worth writing about. Didn't pick up a single new idea. The speeches were platitudes, the committee meetings were dull routine, and the people in attendance just seemed to be milling around without any plan or purpose."

Who's to blame for meetings like that? Primarily the association executives and staff. They plan this year's meeting on the pattern of last year's, and ignore new developments that most vitally concern their members today.

But even a dynamic, imaginative staff can't do it all. The members themselves have to put burrs under the executives' saddles and tell them specifically what they expect to get for their dues. What's more important, they have to do most of the work themselves. For an association is just what its name means—a mutual effort for mutual benefit.

If a member wants, say, a committee session or a discussion panel on a certain subject, he should be ready to serve on that committee or panel. And when he does, he may be surprised to discover the truth of the saying that the more he puts into it the more he takes out of it.

A very large percentage of today's industry leaders developed and exhibited their abilities through association work. The same route is open for the oncoming crop.

If you can't, or don't care to, work on committees and programs, you can get more out of a meeting by putting more into your private discussions with others in attendance.

Anybody in the business can tick off a list of pressing current problems crying for a solution. Only serious thought and wide discussion will solve them.

So if these things aren't on the program of your next meeting, talk them up in the corridors and hotel rooms and sharpen your own thinking while picking others' mental pockets.

That's one way anybody can put more into an association meeting and take more away from it.

—Henry D. Ralph.

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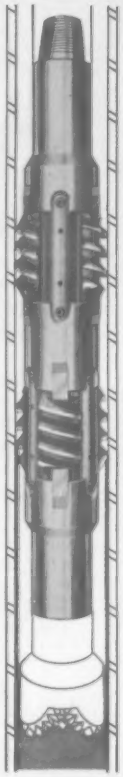

PRODUCT NUMBER 620-C

WHAT THE BIT FAILS TO REMOVE CAN PROVE EXPENSIVE!

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Oil's pessimism is definitely diminishing

SORTING OUT the significant statements made at the API meeting and putting them together to form a pattern clearly shows that the U.S. oil industry was given a promise and a lecture, a bright prospect conditioned on a stern regimen.

The prospect is that the statistical imbalance of excess capacity versus a slowed increase in demand is not fatal, can be lived with, and may disappear sooner than had been supposed.

The condition is that to restore its earnings position over the next several years, the industry must practice mature self-restraint and managerial acumen to which it has been unaccustomed in the past.

EXTREME PESSIMISM over the fate of the industry during the next decade is no longer in order. If it cannot yet be replaced by unbounded optimism, a realistic appraisal must call the outlook hopeful.

The demand picture looks somber only when viewed as a percentage gain. The forecasts are for a slower rate than in the past, but when compounded on the present base this represents a husky volume year after year. It is a growth prospect that would be envied by many industries.

On the other side of the equation, the excess capacity, which seemed such an insuperable obstacle to prosperity, resolves itself on examination to be largely a problem of proper management.

The real hope—the big reason why pessimism is fading—is that the industry's decision makers now know how to live with excess capacity and that they will apply this knowledge constructively.

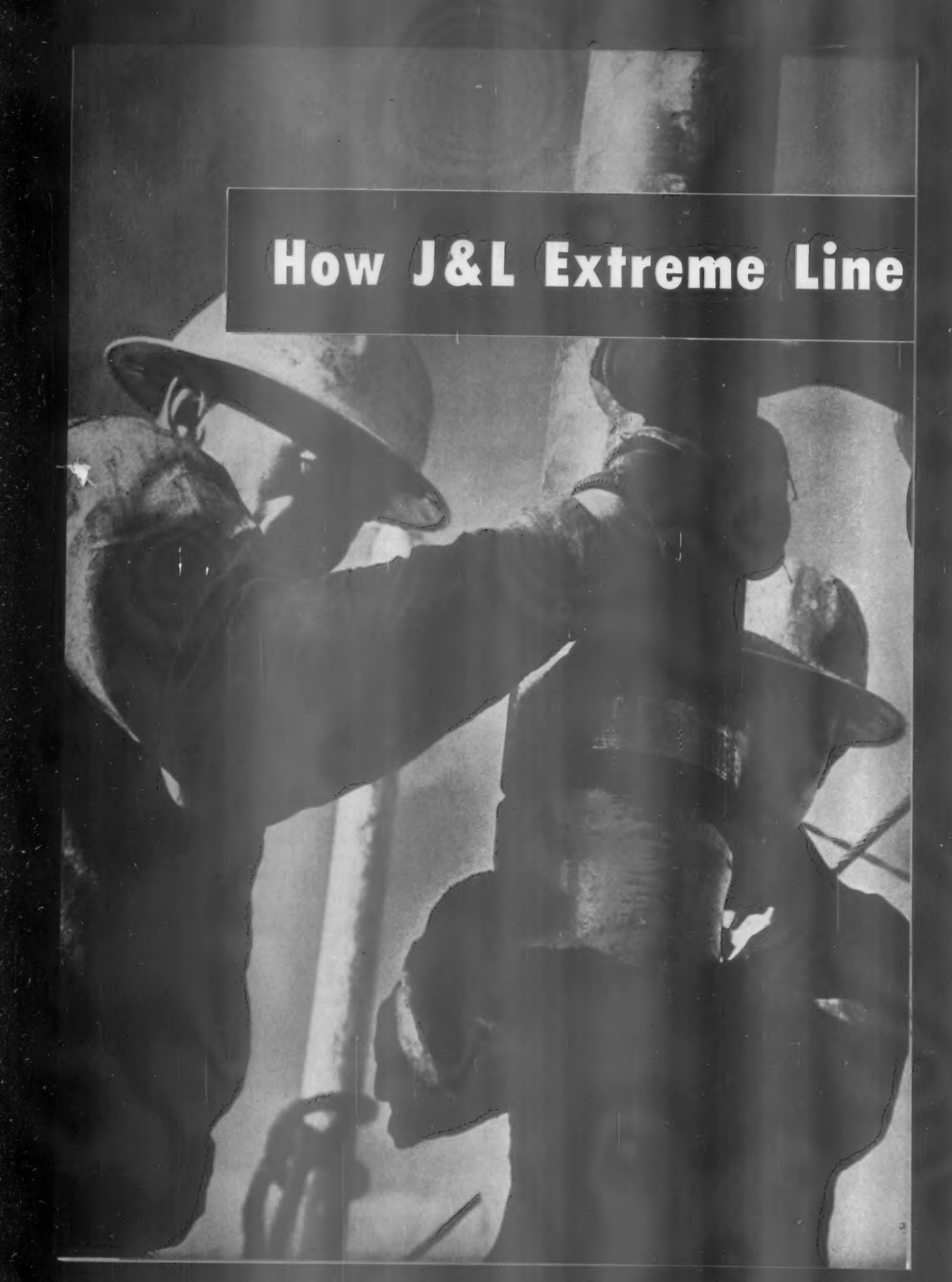
A realistic, responsible management of present excess capacity and the wise use of capital to avoid increasing it can end the existing chaotic conditions in production, refining, and marketing.

For example, getting rid of the currently top-heavy inventories of gasoline and distillate will be a simple matter if refinery managers generally follow the example of those who have learned the folly of seeking profits from incremental unit output beyond market requirements.

The prospect for much increase in prices during the next couple of years is not great. But restraint in handling excess producing and refining capacity will keep prices from falling further and will stiffen them a bit. And careful attention to costs and the use of capital can increase earnings so as to attract required new investment.

SO THERE IS GENUINE GROUND for a hopeful outlook. It rests not so much on any marked change in statistical conditions as on the changed attitude of industry leaders toward those conditions.

The industry can't hope for prosperity like that of the postwar decade. But it can hope to pull itself out of the quagmire and onto solid ground now that it knows where its bootstraps are and is showing a disposition to pull on them.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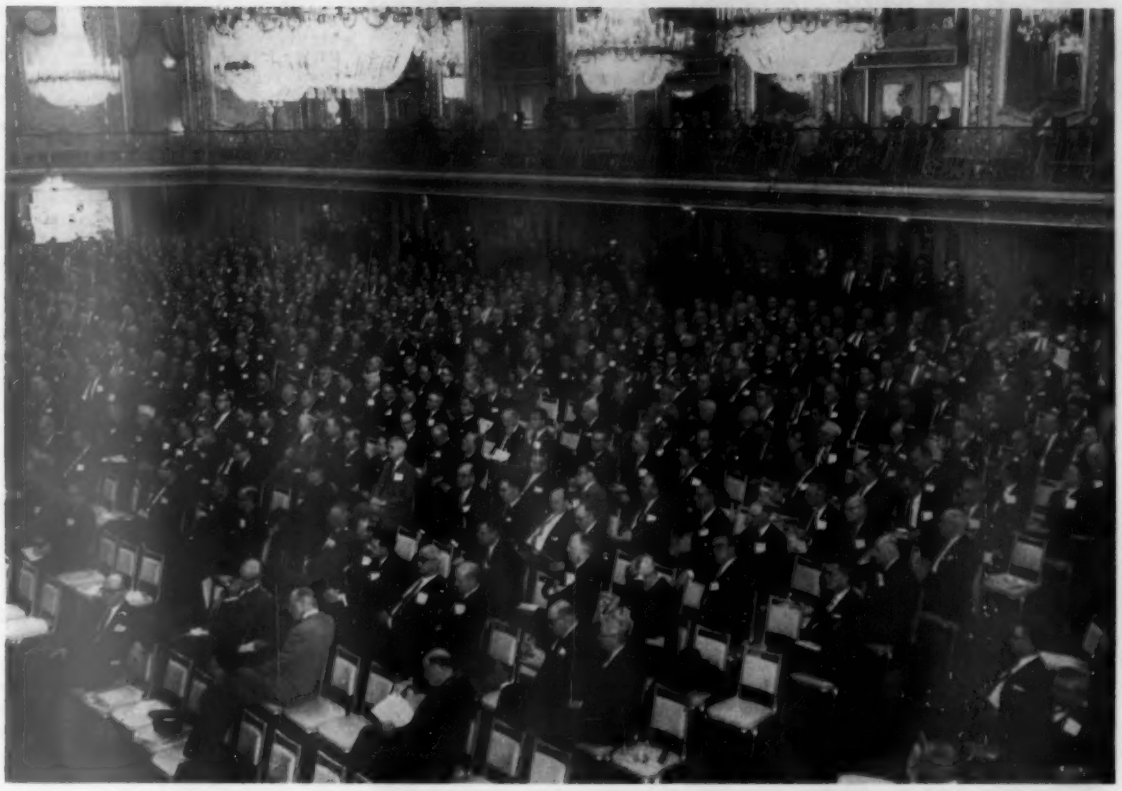


At the API: Optimism

PESSIMISM about the oil business has been overdone.

Conditions are not as bad as it appeared they might be a few months ago. And factors now at work promise to make things considerably better in the not-too-distant future.

That heartening overtone was clearly audible in platform pronouncements and corridor conversations as more than 6,600 oil men conclaved in Chicago for the annual meeting of the American Petroleum Institute.

A year ago at this meeting the gloom could have been shoveled with a pitchfork. Today oil men are still soberly concerned about the condition of their industry, but they see positive signs that the clouds are lifting.

With careful planning and skillful management, they agreed, all segments of the industry can learn to live with the overcapacity that will continue to exist for some time yet.

And while the world surplus of oil is still a potentially depressing factor, it may disappear sooner than most people believe, and profits can be made in the meantime.

Most pessimistic of all was Continental's President Leonard McCollum. With tongue in cheek he said:

"I am terribly pessimistic because demand for oil is up only 5.5% and I wanted 8; capital investment in the industry is up only 10% and I wanted 25."

He then went on to explain that the prospects for a rapid increase in oil consumption throughout the world, particularly outside of the United States, are so great that the world surplus of crude producibility keeps looking smaller almost from month to month.

A year ago, said McCollum, studies suggested that surplus crude might hang over the market for 20 years. A little later a more realistic study cut this time in half. More recently another study pegged the end of the surplus at 5 years. And today McCollum thinks world supply and demand could come close to a balance in as little as 3 years.

Hopefulness helps . . . Professional economists were more cautious in the forecasts they made for the record, but they all expressed varying degrees of optimism, even for the short range.

And one of them suggested that all statistical forecasts should be modified by what he called the "coefficient of hopefulness"—meaning that the oil industry always manages to work off its surpluses more quickly than seemed possible at periods of greatest excess capacity.

But hopefulness alone won't do the job, it was stressed by speaker after speaker. Competition will remain intense, and it will take new thinking and smart management to get indivi-

What they said about:

ECONOMIC OUTLOOK

"The oil industry is in much better shape than 2 months ago. Since then refiners have made a steep drop in runs. Up until then inventories had been far too high. They're much better now."

Fred Van Covern, API director of statistics.

"Bankers are helping solve the refinery overcapacity. They're turning cold shoulders on loans. This should cut down on irresponsible construction."

H. S. M. Burns, president, Shell Oil Co. and retiring API board chairman.

"The next few months will be a period of shortages, of scrambling for steel, of trying to increase production of metals to meet urgent demands.

"The first half of next year promises to be a period of very rapid expansion in production and employment. Shortages should be worked off and inventories rebuilt. The rate of advance will be slower during the second half."

William F. Butler, vice president, Chase Manhattan Bank.

"A pronounced change in sentiment regarding the duration of oversupply has come about, largely as a result of a growing awareness of the tremendous volumes of oil needed each year just to meet the incremental growth in demand."

L. F. McCollum, president, Continental Oil Co.

dual companies and the industry as a whole safely through the next couple of years.

There was much condemnation of the "incremental barrel" philosophy—the obsession for cutting costs by running at full capacity without regard to other factors or general consequences.

One economist rechristened it the "sinkremental barrel"—meaning that forcing unneeded oil products on the market at distress prices threatens to sink the entire industry.

Serious, not critical . . . In short, the sum of forecasts and analyses very clearly is that the industry's statistical position—its excess capacity in all divisions as compared with demand prospects—is serious but not critical.

The critical factor is how oil men manage their affairs to contain this excess capacity and prevent it from overwhelming them.

There was quite a bit of advice on this subject. A chemical executive suggested that oil men concern themselves less with individual products and think of themselves as purveyors of packaged energy, and thus take a broad and long-range view.

Barney Majewski, that hardy perennial of inspirational orators, pleaded for individual initiative and self-reliance rather than seeking salvation in laws and regulations.

Freer markets rather than more restrictions were defended by several speakers. Natural gas was most frequently mentioned in this connection.

Although no one seemed hopeful of early legislation to free producers from federal price control, all expressed continuing determination to work for new gas legislation no matter how long it takes.

And, in the meantime, all hands were warned to fight off the attempt of coal interests to jam through controls over the end use of energy resources which would restrict consumers in their choice of fuels.

Maturity at 100? . . . Since this is oil's centennial year there was frequent reference to the fact that a man may be nearly dead at 100, but an industry is just beginning to get maturity at that age, and that maturity of thought and action is about all the industry really needs to speed it healthily into its second century.

But, it was stressed, industrial maturity does not consist of looking back at the "good old days", but rather meeting new challenges with confidence and competence.

The wellspring of economic progress, a noted economist told the meeting, is innovation — the constant stirring up of conditions by people with new ideas, new products, new methods. Without such there is little progress, but for the innovator there are unlimited opportunities.

Runs too high . . . The most-needed management innovation at the moment, it seemed to be the universal opinion, is a real determination to hold refinery runs to the types and volume of products that the market can consume.

The view was echoed constantly that the propensity for running all refining equipment at capacity is the greatest single cause of the industry's current trouble and the greatest single threat to its long-range recovery from the 1958-59 recession.

But producers, too, were admonished to adapt their thinking to the condition of surplus capacity and to avoid increasing producibility through such means as wider spacing and delay in drilling development wells.

If the message given the oil industry at this meeting could be condensed to one sentence it would be:

"Things are tough, but they're not as bad as we thought they were going to be, and if we are smart we can help them get a lot better within a reasonably short time."

New API Chairman: Jersey's Rathbone

• More aggressive public relations, unified industry are 1960 goals.

MONROE Jackson Rathbone, president of Standard Oil Co. (N. J.) is the new API chairman.

He succeeds H. S. M. Burns, president of Shell Oil Co., and assures continued strong leadership for the next 2 years of the industry organization.

Rathbone, after his election in Chicago, told a news conference that the nagging problems of public and family relations and of excess producing and refining capacity would have top priority for industry action.

Rathbone predicted that it would be at least 2 or 3 years before the present world oversupply of crude and excess refining capacity could be brought in balance.

But he expressed hope that it would be done through a combination of better management and increased demand. He forecast a demand gain of 4% for the U. S. and 6% for the rest of the Free World in 1960.

The proper excess productive and refining capacity for needed flexibility, in his view, is 10 to 15%, or about half of that now existing.

The problem of weak product prices is a direct function of excess refinery runs, he said, adding that the effect of stocks "doesn't amount to a hill of beans."

Public relations . . . Rathbone announced two major planks to his platform for his tenure:

. . . **More aggressive promotion** of public relations for the oil industry. "They're not nearly as good as they should be . . .. That's not right and we don't deserve it."

. . . **Better understanding,** cooperation, and appreciation of each other's problems and points of view among the various industry segments themselves.

"The first plank is impossible to accomplish without the second."

"What we need is a better understanding that the industry is an integrated whole, that no part can prosper without the others, that one side is not 100% right and another all wrong," he said.

Rathbone expressed pleasure with the results of the first year's operation of the Committee on Public Affairs, which has taken over all API public relations' efforts. Its efforts will be expanded and its activities harder hitting, he said.

Jack Rathbone . . . We need to promote increased demand.

General comments . . . Rathbone also said, in response to a variety of questions put by the trade press:

. . . **The industry needs** to promote increased demand for oil—"this phase of research has been terribly neglected."

. . . **Running to the Government** to seek guaranteed markets is a source of great worry. "Once you run to the Government for help, it's difficult to stop. Controls breed more controls."

. . . **Jobbers' demands** for an audit of oil-industry profits can't be met by API, largely for legal reasons—"but API should perform any service of this type that can be done legally and properly to disseminate information to dispel misunderstanding."

. . . **Heating oil** will start getting a better break in competition with gas—"oil burner improvements and the increased price of gas will cause adjustment; gas should sell on about a parity with oil, perhaps at a premium."

. . . **Atomic energy** will enjoy substantial growth in Western Europe the next 25 years—"but of all forms of energy oil will be the big wheelhorse."

Rathbone story . . . The new API chairman is a vigorous man of 59 and a veteran refiner and top manager for Jersey Standard.

Rathbone was born at Parkersburg, W. Va. His father was employed more than 20 years at the Jersey Parkersburg refinery and from him Rathbone got his early interest in petroleum refining.

A chemical engineering graduate of Lehigh University, Rathbone got his first job with a Jersey affiliate in 1921. This first job was as a design and drafting engineer at the Baton Rouge refinery of Standard Oil Co. of Louisiana, now a part of Esso Standard Oil Co.

Rathbone won rapid promotion to construction engineer, assistant superintendent, general superintendent, assistant manager of manufacturing, and vice president and general manager.

Rathbone saw the Baton Rouge plant expand into a large integrated refining and petrochemical center which produced a series of industry firsts.

Rathbone moved to New York in 1944 when the Louisiana company was merged with Esso Standard. His job was Esso president. He remained in that post until elected to the Jersey Standard board in 1949. He became Jersey Standard president in 1954.

Porter Tells the Press New Gas Bill

• API president said stepped up intrastate sales plus normal demand growth pose a threat of a gas shortage. This is gaining industry some support, but strong backing from the administration is essential to new gas legislation.

API PRESIDENT Frank M. Porter emphatically joins the growing sentiment in the oil industry that any new gas bill must be launched by the Eisenhower administration.

Porter made this clear last week at a news conference at the annual API meeting in Chicago. He declared that gas producers cannot successfully conduct a campaign for a new bill freeing them from government price controls.

"We need some new faces in church," Porter said. "We must have strong support from the administration to kick the effort off dead center."

Porter recalled past sad experiences of the oil industry in trying to lift burdensome federal controls. He said the experience also taught industry leaders that any new effort must get cooperation from all segments of the industry.

Porter said he felt the gas distributors would back more strongly a new campaign in Congress because everyone can see a gas shortage down the line under present conditions. He said the shortage would stem from large amounts of gas going into intrastate sales and from growing demand which will tax presently committed reserves.

Porter's remarks came in answer to questions for comment on recent advice by Interior Secretary Fred Seaton that the petroleum industry should initiate a new gas bill campaign.

Frank M. Porter . . . we need strong support from administration.

Porter also told newsmen he doubted that a serious fight would be made in the next Congress to lower or repeal percentage depletion.

"It'll be mentioned, of course, you can bet," he said.

Outlook improved . . . API Statistician Fred Van Covern also told newsmen that the oil industry is in much better shape now than it was 2 months ago.

He said recent cuts in refinery runs

Coal Industry Should Fight for Market, Not Run

• Porter uses plain talk in attacking coal's program for a national energy policy based on end-use controls.

ATTEMPTS by the coal industry to use federal control over fuels to freeze oil out of its markets came in for a full blast at the first API general session.

API President Frank M. Porter declared coal interests are trying to use government as an instrument to further their own commercial objectives.

That's the danger he sees in a proposed energy study which would be the basis for a national fuels policy.

"The coal industry claims to be suffering from severe economic problems," Porter said. "Perhaps this is so. But I need not remind you that the oil industry has its problem too—plenty of them, any many are economic in origin.

"There is also no need to remind you that if the coal industry is troubled by the competition of natural gas, so is the heating-oil industry.

"But instead of running to government, the purveyors of heating oil are exerting themselves to meet this competition the only way it should be met—with their own competitive counter attack."

Oil facing reality . . . Porter said heating-oil people are striving to improve and promote their fuel. They are encouraging more efficient burners to bolster consumer acceptance for their product.

"In short, the heating-oil people are fighting this battle the way it should

Up to Ike

had lowered inventories from their perilous highs.

Van Covern said he felt supplies of fuel oil east of California are sufficient to meet usual demand. Porter in a general session message declared, however, that residual fuel-oil inventories should be carefully watched in the next few weeks to avoid a critical shortage if unusual demand develops.

Van Covern said he felt that current confusion over just how much fuel oil is stored on the East Coast will be cleared up when all the facts are in. Porter and Van Covern also touched on:

... **General outlook for oil.** A small increase is expected next year in demand. But the markets have been in bad shape and still are. Much will depend on refinery statesmanship in holding runs.

... **Imports,** and why controls didn't solve troubles of domestic producers. Control of imports wasn't the complete answer to the domestic oversupply problem. Natural gas had been—and still is—a major factor in cutting down the market for domestic oil.

... **Drastic production** cutbacks in Texas. Low allowables in Texas have played a part in encouraging refiners to cut runs but not as much as many believe. Several unprorated states still have continued high production.

Van Covern also said he believed refiners became acutely aware of the economic necessity to slow down runs to clean up the sloppy inventory situation.

What they said about:

PUBLIC RELATIONS

"Folks have learned a great deal about us this year. I am confident they will react more favorably to problems of the industry in the future."

W. R. Huber, centennial director, American Petroleum Institute.

"Until the people in the oil industry understand and are articulate about the facts of the oil business, we can't expect our customers or our lawmakers to understand.

"And until they do, we shouldn't be surprised when we are confronted with unnecessary investigations, still higher taxes, restrictive legislation, and false charges that we charge too much for our products, make huge profits, and avoid taxes."

James M. Patterson, director of public relations, American Oil Co.

"It should frighten you that the oil industry is losing its voice in the domestic and foreign policies that bear on its everyday life."

J. Howard Edmondson, governor of Oklahoma.

"It has always struck me as truly amazing that this industry, which is so daring, so venturesome, so fearless in the conduct of its daily operations, often becomes timid, vacillating, and uncertain when it ventures into the area of public relations."

B. L. Majewski, president, Great American Oil Co.

to Washington

be fought," Porter said. "And they are facing reality the way it should be faced."

Porter declared he hoped the coal people soon will realize their problems stem from the freedom given Americans to choose products. Research, product improvement, and promotion win this consumer preference.

Porter said this is the course the coal industry also should follow instead of seeking legislation to force its products upon protesting consumers. The public has elected to use fuel oil and gas for convenience, comfort, and efficiency.

"This was their choice to make, as free people, and they made it freely," Porter said.

Risk is inherent . . . American society gives no guarantee of success to anyone.

It's a competitive economy in which there's a constant risk that some other product will enjoy greater acceptance. The coal industry seems unwilling to take this risk, he said.

Porter declared that adoption of a national fuels policy would deliberately exclude natural gas and selected oil products from some of the markets in which they compete with coal.

"If this country resorts to end-use controls to solve the coal industry's problems, who can expect that it will stop there? Others will demand the same solution for their competitive problems," he said.

The API executive suggested such questions should be settled openly in the market place through free competition. He added the oil industry does not object to an open-minded, impartial study of the energy outlook in this country. It does object to a study which is intended to advance self-seeking aims of its advocates.

Governor Edmondson . . . Everything is not all right.

Squabbles Don't Help

. . . API is told by Oklahoma governor. And remaining aloof from politics today is simply naive, he tells oil men.

OIL MEN in all sections of the industry should close ranks and stop giving comfort to their enemies by internal squabbles, Gov. J. Howard Edmondson of Oklahoma told an API general session.

Touching on such controversial oil problems as gas regulation, depletion, and imports, the youthful governor advised:

"As oil men and as an association, you should think hard and long before you are a party to another squabble within your industry.

"Nothing is so heart warming to your enemies in Congress as a discontent among yourselves."

Regulation . . . Edmondson declared all oil men—and not gas producers alone—have a vital interest in trends started by gas regulation. With continued gas regulation, crude oil may not be far behind, he said.

"The situation came upon us with great suddenness—don't be lulled into thoughts that it cannot happen again," Edmondson warned.

Even though oil and gas men have fought for a gas bill through two Presidents and numerous sessions of Congress, they will have to go back again, Edmondson said.

Depletion . . .on the issue of depletion allowance, the governor also warned the first real battle may come in an effort to reduce the depletion on foreign production.

This may be taken as a special case, he said, because depletion coupled with foreign taxes and State Department concessions has enabled some companies to operate for years without paying any income tax at all.

Imports . . . Edmondson termed the imports issue one of the nation's most serious problems and advised oil men: "Today you stand a chance of being talked into a mood of 'everything is all right and you should remain calm.'"

There is ample evidence, according to Edmondson, that the industry faces an import program of some kind for many years to come, and that majors and independents alike must recognize the situation. They must establish a point where both can prosper while interests of the nation and America's obligation to the rest of the world are fulfilled.

Edmondson touched on one economic trend which holds danger to the entire nation: Reciprocal trade. He said for the first time in history the United States is no longer a net importer of goods. It will end this year with a trade deficit of nearly $4 billion.

"In the past 18 months our imports have jumped some 20% and our exports have declined in about the same proportion," he said. "The effect of a continued trend such as this would be disastrous."

He pointed out that, historically, strong nations have been net exporters and urged the U. S. to return to the sound principles for which the Trade Agreements Act was intended and implement the reciprocal theories for which it must stand.

Politics . . . Edmondson gave oil men this parting advice: Don't try to live alone.

"An organization, like the API, that has readily adapted itself to change and technical improvement, should also be alert for political and human changes that affect your industry and your individual lives.

"To remain apart—as individuals, or as an organization—from political parties or ideologies is naive in this world in which we live today."

Donnell New Head of 25-Year Club

NEW PRESIDENT of the 25-year club, elected at the annual dinner, is J. C. Donnell II, president of Ohio Oil Co.

Donnell has been with Ohio since his graduation from Princeton University in 1932 and first was named to the API directorate in 1945. He succeeds W. K. Whiteford, president of Gulf Oil Corp.

The next executive secretary is C. J. Wood, of Harry P. Dunn Co., Chicago.

PANEL on the long-term outlook: Walter Levy, M. E. Hubbard, Minor Jameson, and W. G. Humphrey.

20-Year Free-World Supply Plentiful

• BP's Hubbard estimates free world (excluding U. S.) can count on total of 425 billion barrels of reserves in next 2 decades. U. S. industry to have 100 billion barrels by that time.

THE FREE WORLD outside the United States will have 425 billion barrels of reserves from which to meet demand in the next 20 years.

It now has 205 billion barrels—on a very conservative basis—and can expect to find another 205 billion during the next two decades.

M. E. Hubbard, of British Petroleum Co., London, gave these figures before a session on petroleum statistics, and he told his listeners they are probably "ultra conservative."

Areas in Hubbard's estimates are:

... **Middle East,** with 175 billion barrels of proved reserves and predicted additional discoveries of 75 billion.

... **Western Hemisphere** (excluding United States), expected to find 73 billion barrels, as compared to present reserves of 27 billion.

... **Far East,** with 10 billion barrels of reserves, and with prospects for finding an equal amount.

... **Europe,** expected to find 1.5 billion barrels to add to its present reserves of the same figure.

... **North Africa,** with 6.5 billion barrels of proved reserves and with predicted additional discoveries of 45 billion barrels.

Estimates are low ... These estimates are perhaps ultra conservative, Hubbard said.

They assume today's methods and tempo of exploration. They include no long shots on discoveries of new oil provinces. There is no allowance for improvement of present production methods, and secondary recovery is projected on the scale of present-day operations.

"Present effort, present exploration, and production methods—of course these will not remain the same, but I will not try to guess the significance of changes which will take place," he said.

U. S. supply outlook ... U. S. oil supply will keep pace with U. S. demands during the next 20 years.

And the industry's record indicates it will be able to find and develop the necessary 100 billion barrels during this time and to maintain reasonable prices.

However, unfavorable changes in the federal tax provisions could disrupt exploration and development activities, said Minor S. Jameson, Jr., executive vice president of the Independent Petroleum Association of America.

Total crude oil awaiting future recovery has been estimated at 500 billion barrels. Whether this figure is accepted or discounted substantially, it seems most unlikely that the physical stock of petroleum will be the limiting factor in supplying needed petroleum liquids for the next 20 years, he said.

And there is good reason to believe that technical advances alone could supply a large share of the oil needed during this period. New techniques have approached 100% recovery in pilot operations. U. S. productive capacity has increased 77% in the last 10 years, while proved reserves have increased only 33%.

Application of increased-recovery techniques to the 200 billion barrels which are known to exist, but which are currently unrecoverable, should make available billions of barrels of additional supply through 1980.

The constant-dollar price of oil (1954 dollars) has changed little since 1920, except for the depression years. And there is every reason to believe that the industry can expand supply as needed, at reasonable prices, Jameson said.

The burning question is what the federal Government will do. Not only would changes in the tax provisions disrupt exploration, but they would also divert capital to other fields, reduce long-term supply, and increase the cost of oil and gas to the public.

The government import policy could also have a far-reaching effect on U. S. activities. It is imperative that this program be handled to preserve a vigorous, healthy petroleum industry in the United States, Jameson said.

Kerryn King

Joe T. Dickerson

James M. Fatterson

Public-Relations Program Has Shifted

• New objectives and new ways of meeting them have been devised to explain and sell the oil industry to the public, King says. Four big problems now: Tax threats, attacks on depletion, misunderstanding, coal's political moves.

DISCUSSION of the industry's public-relations program was in marked contrast with previous API conventions.

There were no rafter-ringing exhortations to "do something," no diatribes against those who "don't understand."

Instead there was a stock-taking, work-shop session of the Committee on Public Affairs which was formed a year ago through merger of the Oil Information Committee and the American Petroleum Industries Committee.

"Facing the Issues" was the topic, and the program got down to brass tacks on how CPA is facing four currently pressing issues:

... **Threats** of even higher gasoline taxes.

... **Attacks** on percentage depletion.

... **Misunderstanding** of the economic problems of the industry.

... **Attempts** to undermine consumer freedom of choice of competing fuels.

Kerryn King, vice president of Texaco Inc., and chairman of CPA, announced that on each of these issues the staff has prepared a wide range of communications materials for local industry groups to use.

Outlook for '60 Is Better Than Some Think,

GENERAL BUSINESS activity will move ahead in strong fashion in 1960, making for a year of great prosperity.

This is predicted by William F. Butler, vice president of Chase Manhattan Bank. This advance should carry over into 1961, perhaps well through the year, he said.

Assuming the steel strike is settled before January, the first half of 1960 will see very rapid expansion in production and employment. Shortages will be worked off and inventories rebuilt.

This rate will be slower for the last half, said Butler, and general business in 1961 may move onto a plateau, preceding a general downturn.

Three forces are at work to indicate this brightening business picture.

Inventories of steel, cars, and the many other products depending on steel will be well below minimum levels by year end. Inventory building could amount to a $10 billion annual rate during the first half of next year. This means a high level of new orders, production and employment.

Consumer spending will exert a second upward force on the economy. Credit does not appear to be out of line with income.

A third force is the expected increase in exports. Third quarter exports rose 12% above the first quarter low this year. Business activity is rising in Europe, Canada, and Japan, and a further rise in exports to those areas appears likely.

Butler tied down his predictions with some figures. He estimates the following trends from third quarter 1959 to third quarter 1960:

... **Inventory accumulation,** up $6 to $8 billion.

... **Consumer expenditures,** up $20-25 billion.

... **Foreign trade,** up $1.5 billion.

... **State and local** expenditures, up $2.5 billion.

... **Business plant** and equipment

W. R. Huber

Emphasis

This is real progress, King said, because it took much of the year to reorganize and reorient the two parent groups and establish local volunteer organizations.

Emphasis, objective, and procedure have been shifted from top to bottom of the program. King cites as examples:

. . . **The school program** is now directed to teachers instead of to students.

. . . **The employe-information** program is being carried on by the companies themselves instead of by outside committees.

. . . **The film program** has been revised to reduce costs and increase quality.

. . . **The press-relations** program has been shifted from criticism to assistance. Editors are being commended for accurate comment, and misstatements are attacked by supplying factual material.

. . . **Two new publications** have been launched — an "external" quarterly, "Petroleum Today," designed to give the public a broad view of the industry's operations and problems; and a bimonthly "Oil Facts," digesting economic data and developments.

Perhaps most significant of all, CPA has settled on a long-range objective as well as on procedures for dealing with current problems.

This objective is to demonstrate to the American public that its standard of living and economic progress depend on an abundance of low-cost energy resources, and to show how the operation of the petroleum industry contributes to that end. All CPA programs are to be geared to this long-range theme.

Schools . . . How the school program has been revised to fit CPA's new format was outlined by Joe T. Dickerson, chairman of the advisory committee on education and who next month is shifting from president of Shell Pipe Line Corp. to executive vice president of Mid-Continent Oil and Gas Association.

Instead of flooding students with propaganda and expendible literature, the program now supplies teachers with work materials and teaching aids of permanent value and designed to be utilized in connection with regular courses in many subjects.

And to put this new material to use, local oil men are being urged to work with educators on their teaching and community problems in order to make the industry's contacts with schools a "two-way street."

Employes . . . The new employe program was described by James M. Patterson, director of public relations of American Oil Co. and a member of the CPA advisory committee on employe information.

The new program rests on the premises that public opinion of an industry is based primarily on the impressions it gets from the industry's employes; that individual employes, particularly at the retail level, are the industry's most effective public-relations men; that these men can be taught how to discuss industry subjects with the public; and that the companies themselves must undertake this task.

As aids, the committee has prepared program outlines and information packages dealing with facts on gasoline prices, competitive conditions in oil marketing, and percentage depletion.

Public affairs . . . The first test of the new program of conducting public affairs at the grass roots through local efforts was the celebration of the oil industry's centennial year, it was explained by R. W. Huber, centennial director.

At first it appeared that this might be a colossal flop because local groups were slow in taking the initiative and in making use of materials the central committee had prepared.

But then, Huber said, things got rolling fast and the final result was that millions of Americans gained a much better understanding of the petroleum industry through the varied types of local programs tying in with the central theme of 100 years of petroleum progress.

Butler Tells API

investments, up $8 billion or 18%.

All this adds up to a gain of more than $40 billion in our total production of goods and services, pushing gross national product from the $481 billion rate to $520-525 billion for third quarter 1960.

There is no question that credit is extremely tight, said Butler. But tight money does not necessarily mean a credit squeeze.

In spite of tight money and high interest rates, Butler believes that it will be possible to finance the high level of economic activity which he contemplates.

Long-range problems . . . While the immediate future looks promising, Butler pointed to five basic problems business faces in the long run.

It must contain inflation. This means keeping a surplus in the federal budget in good times, keeping the increase in money and credit in line with physical output of goods, and limiting wages to productivity.

If business can control inflation, it will go a long way toward keeping its position in the expansion of international accounts, said Butler.

Moderating recessions pose the third long-range problem. To moderate recessions, it is probably also necessary to moderate booms, Butler declared.

Business also needs to find ways to accelerate the rate of economic growth. This means removing some barriers: A costly and ineffectual farm program, tolerance of featherbedding, use of tariffs and quotas as a form of business featherbedding, an inefficient transportation system, and inefficient governmental administration.

Butler's final problem was a philosophical one. Business needs to make more proper use of its affluence. This he defined as providing the maximum opportunity for individual development and fulfillment in a world of peace.

Surplus to Melt Sooner than Expected

• Most folks are revising estimates of the duration of overcapacity, McCollum tells Nomads.

THE OIL INDUSTRY is paying too much attention to its current problems, and not enough to its opportunities.

It is preoccupied with excess capacity without realizing that the period of oversupply may be a short one.

With these thoughts, L. F. McCollum, president of Continental Oil Co., took issue with the pessimists. We must admit that some of our basic economic factors have changed, he told the NOMADS at their annual luncheon at the API.

But we should not ignore the positive factors of increasing demand, rising capital expenditures, and an excellent earnings picture so far this year.

L. F. McCollum . . . There's no need to worry about the future.

Oversupply . . . Reviewing the problems facing the industry today, he drew attention to a pronounced change in sentiment regarding the duration of oversupply.

This sharpened optimism has come about largely as a result of growing awareness of the tremendous volumes of oil needed each year just to meet the incremental growth in demand, he said.

Oversupply was not created overnight. It has been building since World War II.

Just prior to the war the ratio of world-wide reserves to annual production stood at about 20 to 1. Today the ratio has swelled to 43 to 1. Outside the U. S. the Free World ratio stands at 66 to 1; inside this country it is 12.5 to 1.

But reserves themselves aren't causing our trouble; it's our increasing ability to produce them in excess of actual demand.

In the Free World today, reported McCollum, productive capacity has risen to 22.5 million barrels daily, while actual production is 16.5 million.

Of this 6 million barrels per day of shut-in production, 3 million exist in this country alone. By contrast, the world's surplus in 1953 was 2 million barrels, practically all of it in the U. S.

Outlook better . . . How long will it take to melt this present surplus to a more workable level?

The answers to this question are undergoing some changes, said McCollum. Early this year it was considered in many circles that the industry would be living with an overabundance for at least 10 years.

A recent study by a large financial house shaved this period to about 5 years. McCollum then referred to M. J. Rathbone's remarks late last month, estimating Free World oversupply might be ended in 3 to 4 years.

Western Europe will play a major role in absorbing the current glut of oil. This year, total Free World demand should be about 17.7 million barrels per day, 6% greater than last year's. Continued growth at this rate is reasonable to expect, he said.

Excess to shrink . . . This heavy increase in consumption is likely to increase free-world demand by 1.2 million barrels of oil daily every year.

This would absorb the present oversupply completely within 5 years, if there were no increase in productive ability.

But new fields will be found and existing fields expanded. Even so, demand will outstrip these additions to productive capacity. The result will be a surplus capacity of much more controllable size within a few years.

McCollum figures this way: The Free World now has a total productivity of 22.5 million barrels daily. Of this, 6 million barrels, or 27%, is surplus.

If demand grows at an annual rate of 1.2 million barrels daily, within 3 years the total increase will be 3.6 million barrels. But during that 3-year period, additions to productive capacity may total only 1 million barrels.

This would mean in 3 years a total productive capacity of 23.5 million barrels, a demand of 20.4 million barrels, and a surplus capacity of only 3.4 million barrels, or 14% of total capacity.

Oil moves abroad . . . One must reach the conclusion that the world oil industry's center of gravity has been moving away from the U. S., McCollum said.

Four years ago, foreign production passed U. S. production, and last year total oil expenditures abroad exceeded those here at home. Total demand in the remainder of the Free World is expected to match that in the U. S. by 1962.

But, said McCollum, the United States will remain the world's largest single oil producing, refining, and consuming country for some time to

come. The shift abroad will be gradual, for three reasons.

First, for many oil companies, domestic income is the only source of capital for exploration and development abroad.

Second, maintenance of a healthy oil industry at home is a national oil policy, for defense reasons.

And third, natural-gas requirements will keep the industry busy on exploration and development, since it cannot be imported in quantity.

Changes needed . . . McCollum then repeated the same warnings he voiced at last year's API.

We are drilling more development wells than we need, to recover oil efficiently and to meet current requirements.

Conservation bodies already recognize the need for prorating production on a "field reserves" rather than a "per well" basis, he continued. States could also encourage new production techniques which would lower well costs.

These views s ill hold, said McCollum. It is up to management to keep costs down in order to be competitive. It is up to equipment manufacturers to supply the industry with better and more efficient tools at reasonable prices.

If we work in harmony and fully understand our m u t u a l problems, there is no need to worry about the future, he concluded.

Overcapacity to End, Burns Tells Press

THE DOMESTIC oil industry should correct its present refining overcapacity by 1964 or 1965 and end this source of market instability, H. S. M. Burns, president of Shell Oil Co. declared.

Burns, also retiring API board chairman, said undoubtedly s o m e government then will try to pressure the industry into building more capacity to meet some emergency.

"But we'll know better next time," he told a special news conference.

Burns termed refinery overcapacity as one of the prime reasons for the industry's present ecenomic trouble. Excess capacity is a great temptation. Refinery managers are tempted to keep their units running to cut unit costs and thereby win a gold medal, promotion, or raise for themselves.

But the heavy operations wind up contributing to product price cuts and actually mean losing money.

He said overcapacity is being corrected by an absence of any refinery building. He added bankers are aiding the situation by t u r n i n g cold shoulders to loans for construction.

The Shell executive told reporters he was very happy to turn over the chairman's job to his successor.

"I'll start heckling from the back rows—it's more fun."

Burns also touched on these oil-industry topics:

. . . Centennial year. "We made a great effort. You have to make so much honky tonk these days to make a story stick. We tried hard not to let this ruin the real story."

The big idea of the year's activities was to show that oil had come of age and was a pillar of the American economy.

. . . New committee on public affairs. It has proved very satisfactory so far. The intent was to focus attention and effort.

The CPA still is a fire department —a preventative and action group. He said the committee would try to avoid "pussyfooting" on controversial issues but declared "we can't please everyone." There will always be issues on w h i c h the house is divided, and, therefore, it will be wise for the council to be silent.

. . . Imports. There's no trouble in setting a gross amount for imports — the headache is saying who'll get the oil. He admitted that quotas may be contributing a bit to excess refinery runs.

. . . Crude oversupply in free world. New discoveries in North Africa are important and very good for the industry. They give the world-wide industry a diversification in supply and won't complicate the supply situation unless the new crude is dumped onto the market.

At the general session the following morning, Burns had these pertinent remarks to make.

"Oil men can best serve their own companies by becoming more industry-conscious. We need to emphasize a greater sense of responsibility to the industry as a whole, to elevate our loyalty above the mere company level.

"If the industry will only be patient and will resist the temptation to run excess crude for lower unit cost, demand should in a few years, absorb this bothersome condition of overcapacity.

"When considering its service to the public, no one can ever accuse the oil industry of producing too little, too late, or too lousy. In fact, one might expect that a grateful government would call industry leaders to Washington for recognition and a pat on the back. And indeed, we are called to Washington."

SPEAKING before the central committee on pipeline transportation is L. B. Moon, Sinclair Pipe Line. Others at the head table are, left to right, J. E. Moss, director of the Division of Transportation; R. K. Paine, Standard of California and committee chairman; John W. Emison, Texas Pipe Line; A. E. Pecore, Humble Pipe Line; and D. F. Sears, Shell Pipe Line.

Pipeliners Seek Ways to Trim Costs

● Reports from 50 pipelines shows automation is growing fast in crude-oil systems. Products lines still adding automation, but at slower rate.

THE PAST YEAR has seen a phenomenal growth in the automation of crude-oil trunk lines.

Automation on product lines progressed at a more modest rate, however.

These trends were brought out in a report by the automation and instrumentation subcommittee to the Central Committee on Pipeline Transportation of the API Division of Transportation.

The amount of horsepower under remote or automatic control on crude lines increased 132% during the past year. At the same time products-line automation increased 11%. Products lines have gone farther faster in this direction and crude lines are catching up.

There was an 80% increase in pumping stations which were partially attended (having no more than 2 men) and a 43% increase in the same category for products lines.

The statistics are based on a survey of 55 companies, of which all but 5 replied. A comparison is made with the 41 companies which responded to the survey a year ago. These 41 companies operate 122,000 miles of line, or 85% of the U. S. total, the subcommittee reported.

Welding . . . The Central Committee heard a report that more attention needs to be given to practices for repair welding of pipelines, particularly for branch connections.

There is also a need for fuller standardization of welding small-diameter pipe. Present standards are regarded as adequate for automatic welding.

What's Automated in Today's Pipelines

	Crude (Gathering)	Crude (Trunk)	Products	Total
Stations reported	6,315	873	390	7,578
Stations with remote control	47	172	134	353
Horsepower remotely controlled	11,060	305,920	140,050	457,030
Unattended, remotely controlled stations	24	104	77	205
Partially attended stations	409	94	92	595
Stations actuated by line pressure or flow conditions	29	29	64	122

Corrosion . . . Investigations are being conducted at Kansas State College regarding the effect of soil bacteria on coatings, wrappings, and cathodic protection.

It is notable that the industry has solved its basic corrosion problems by cathodic protection, coatings, and inhibitors, and progress is still being made in these areas.

Hydraulics . . . Multiphase flow of gas and oil is understood much better than it was a few years ago, but more work remains to be done.

For the study of two-phase flow, a data bank has been established at the University of Houston. The most promising types of equations will be evaluated by computer.

Now there is often considerable discrepancy between predictions and results.

The use of mechanical separation between products batches is increasing. "Rubber balls" have achieved notable success in reducing interfacial mixing. As much as one-third reduction in contamination has been reported.

Plastic pipe . . . Plastic pipe has not solved all the problems necessary to meet various pipeline requirements, al-

though properties are being improved.

While many advantages were listed for plastic pipe, certain disadvantages still prevent its use for many applications. Glass-reinforced epoxy material was mentioned as having the most promise for pipeline use.

Pressure piping . . . The ASA code on oil transportation pressure piping has been approved and is now available from the American Society of Mechanical Engineers, New York, for $2.50 per copy.

The small number sold indicates the pipeline men do not realize that it has been published.

The oil industry does not need different pressure piping codes for different fluids handled under the same pressure conditions.

Dispatching . . . Of particular interest during the past year have been instruments for monitoring, special requirements for handling aircraft fuels, and the use of electronic computers.

Attention was called to the advantage that products pipelines might derive from the end-point indication technique used by refineries and terminals. The extra expense incurred by pipelines for extra tankage needed for crude-oil segregation is justified by the reduction of refinery costs.

Evaporation . . . Evaporation is less for crude oil than it is for motor fuel of the same vapor pressure.

Data is needed for improving the prediction of vapor losses for all fluids handled by the industry.

An important feature of LACT is the reduction of vapor loss in producers' tanks before receipt by pipelines. Pipelines need to adjust to handling more volatile crude as a result of this.

Storage-tank coatings . . . Inorganic zinc coatings for the inside shells of tanks are proving their value in corrosion protection. Also, low-cost plastic resins with chopped fiber glass for tank bottoms have been found worthwhile.

Metering . . . Acceptance of positive-displacement metering for custody transfer is increasing. Continuous calibration was said to be better than stop-and-start calibration for meters.

Communications . . . A new "tentative" API technical bulletin, No. 1106, on communication circuits for use in oil-industry automation, is now available from the New York headquarters.

The bulletin, entitled "Bulletin on a Classification of Communications Circuits for Use in Automation in the Oil Industry," is intended as a guide and is expected to serve a great need, which has been felt for some years.

There are some private discussions regarding the need for investigation of the requirements for building pipelines so that they might be used for data transmission. Recent work done in Italy indicates that pipeliners should explore the subject.

HONORED for his long API service is Fred Van Covern, right, who is retiring. An illuminated scroll was presented Van Covern by Maynard I. Landa, chairman of the committee on petroleum statistics.

Van Covern Ends Long Career

A REAL VETERAN of the API staff, Fred Van Covern, director of statistics and research, is retiring this year after 35 years service to the industry.

Van Covern plans now to undertake several personal projects "I've wanted to do for years but never could because of my work schedule."

He was the recipient of a special certificate honoring his work by API officials at the Chicago session.

Van Covern is a native of Brooklyn and received his education in New York. He graduated from Brooklyn's Manual Training High School and Pratt Institute and studied general science at Cooper Union.

He first came into the oil industry in 1917 with Carter Oil Co. and quickly transferred to the foreign production department of Standard Oil Co. (N. J.), serving with Romanian and Polish subsidiaries in Europe.

He returned to this country in 1924, joining the API staff only 4 years after the organization was created. In 1929, he was promoted to director of the Department of Statistics.

Van Covern twice took time out to help federal agencies. The first such occasion was in 1933 when he took a leave of absence from API. He was named officer of the planning and coordination committee under the NRA code in Washington and was made vice chairman of the Committee on Statistics and Economics.

He returned to API to direct development of a special research and analysis program. Again, in 1941, he was named secretary of the Petroleum Industry War Council's committee on petroleum economics, and in 1943 became chairman of PIWC's working subcommittee on storage requirements. He still is serving as chairman of a special National Petroleum Council study.

Oil's Outlook Better Than Investors

- Financial analyst says the prescription for oil-industry health has these ingredients: Tight import controls, lower refinery runs, price hike in crude and natural gas, and lower ratio of capital spending.

THE DOMESTIC oil industry must have rigid import controls and follow a course of tight management in the next decade. This is the way to maintain a profitable industry and regain lost prestige with the investing public.

These views were advanced in a thorough discussion of oil's economic outlook by Donald K. Russell of Lehman Corp., New York, in an address before an API production session.

Russell gave this economic prescription for the industry:

... **Refinery runs** 5% lower than normal.

... **Tight control** on imports of crude and products.

... **A crude price** of $3.50 per barrel in the next decade.

... **An average natural-gas** price of 19 cents per M.c.f.

... **A low ratio** of expenditures to income.

Russell frankly told oil men that investors in the last 2 years have given the domestic industry a poor rating.

"At the 1957 peak," Russell said, "oil and gas stocks represented over 20% of the value of the big-board stocks. But at the end of last September the percentage had dropped to 13.5. The loss of relative position by oils approximated $20 billion."

False idea . . . Russell declared pessimistic impressions of the domestic production industry are unjustified.

He said flaws in this belief include:

... **Growth prospect.** Oil's outlook is still satisfactory and compares well with that of many industries.

... **Profit margins.** Earnings are not necessarily frozen between low import prices and governmental price surveillance.

.... **Ability to act.** The oil industry can, if it will, cure many of its problems by cost reduction and realistic, rather than chaotic, management. The classic squeeze between revenues and costs in the last decade partially explains the oil man's current problems.

Russell said the essence of the last 10 years is this: "We operated our production at a steadily declining ratio to capacity. Gross income gained only moderately. Rising costs, particularly capital costs but also operating and exploratory costs, cut increasingly into net income."

Donald K. Russell
... Oil can be glamorous again.

The investment analyst declared this performance gives a complete answer to those who think imports should be increased to "save" domestic reserves. He asserted if the 10-year trend should continue, it would mean unprofitable employment for capital and would gradually ruin exploratory effort.

The demand picture . . . Total demand for petroleum hydrocarbons should grow at the rate of 4.2% per year in the current decade, Russell said.

The gain will amount to 7.3 million barrels daily with somewhat less than half coming from marketed gas. He projected gas production at a 5% growth rate per year, reaching about 18 trillion cubic feet in 1968.

Growth of oil and natural-gas liquids is estimated at 3½% per year, reaching 13 million barrels daily in 1968. For oil alone, the growth rate should be 3% per year for an average increase of 249,000 bbl. daily and bringing production to 9.2 million barrels.

In recent years, the percentage gains in demand have been smaller. Important factors in this include slower growth of automobile population, completion of railway dieselization, flatter sales growth of heating oils, and tremendous impact of natural gas.

"The 1958 decade showed a gain of 3.3 million barrels per day in demand for oil and liquids, a gain 600,000 bbl. daily greater than in the previous decade," Russell said.

Domestic crude production failed to share fully in this demand growth largely due to imports. While domestic demand increased 3.3 million barrels daily in the decade, domestic production increased only 1.2 million barrels per day. Imports in the last 10 years, meanwhile, took up 1.3 million barrels daily while the balance of the demand increase was absorbed by gas liquids.

While this unsatisfactory domestic production performance was occurring, the domestic industry built up a huge production capacity. The National Petroleum Council last estimated producibility at about 9.9 million barrels per day.

This means that in the last 10 years crude production has equaled only 26% of the rise in producibility.

The revenue picture . . . The unsatisfactory price trend in crude is due largely to rapidly increasing imports and refining excesses in this country.

Russell said the cheaper price of foreign crude has been substantially intensified by the distressed tanker market. The tanker fleet was seriously overbuilt. In addition a cost revolution occurred because the big new ships can carry oil at half, or less, the cost of the old T-2's.

Crude prices also have been put under pressure by excessive refinery runs. High product inventories resulted in soft product markets.

At the time these revenue trends were taking place, oil men sharply increased capital expenditures. But they brought disappointing increases in gross revenue and resulted in heavy charges against income.

Expanding wellhead revenue to include crude, gas, and liquids, Russell said, total wellhead revenue for the last 10 years averaged $332 billion per year. Capital expenditures for domestic production averaged $3.4 billion per year or about 16% of gross property account each year.

"On that kind of spending some

Think, API Told

other industries might expect to increase net income at a rate of 10% or more per year," Russell said. "Domestic oil, however, showed a growth of less than 5% yearly in gross revenues for the 10-year period. It showed a decline in net income."

Russell declared that a substantial element in this spending by oil, however, was drilling for production, rather than producibility. The operator was trying to offset declining allowable rates by development drilling that would increase his individual total allowable.

Key to better times . . . The pessimistic trends of the past are only part of the story and point out what must be done, Russell said.

Key to better things, he said, is the future treatment of gas. Of total petroleum energy, gas provided 37% but brought in only 14% of wellhead revenue.

He said gas should be viewed in terms of energy rather than revenue contribution. This will give a vastly different picture of demand growth, wellhead prices, quantities of reserves added, and reserve costs.

Russell used the barrel equivalent of gas at 5.604 M.c.f. to show this picture: Of energy marketed, gas last year of 11 trillion feet actually becomes nearly 2 billion barrels of oil. That's about 5.4 million barrels per day, compared with last year's crude production of 6.7 million barrels.

Total demand for petroleum energy then would be 14.5 million barrels per day rather than 9.1 millions attributed to oil and liquids alone. If the 10-year growth rate of this total demand becomes 5.7% rather than 4.6%, the 10-year gain in total barrels per day is 6.2 million against 3.3 million for oil and liquids.

On the energy basis, the wellhead price of petroleum hydrocarbons is moderate. Average wellhead price for gas last year—11.9 cents—becomes 67 cents a barrel. The price paid the domestic producer last year then was a blend of oil at $3.01, liquids at $2.29, and gas at 67 cents, a weighted average price of $1.99 per barrel. Oil and gas together brought a weighted price of $1.97.

The income outlook . . . Russell predicted a total 1968 wellhead income of $16.5 billion, a growth rate of 5.8% per year from 1958.

This probably will require a capital expenditure for production of $7.1 billion or 43% of value. Gas and oil must carry the burden of providing this revenue, Russell said, because gas liquids will yield an increase of only about $600 million.

The breakdown predicted by Russell:

. . . Gas-revenue increase of $2.1 billion.

In the absence of a gas bill, prices will continue below their economic level but, nevertheless, must rise in the coming decade, Russell said. He predicted a 1960 wellhead price of 19 cents per M.c.f., up 7 cents, compared with a rise of about 5½ cents in the past decade.

. . . Oil revenue of $4.4 billion.

An increase in crude prices to $3.50 per barrel would be needed to reach this sum, however. Rising production, even with tight import control, might add 250,000 bbl. daily or a gain of only $2.75 billion of revenues if prices remained at $3 a barrel.

Under this picture, gas will still yield only 21% of revenue while providing 40% of petroleum energy. This means oil will continue to carry the main burden of providing funds for domestic products.

Danger points . . . Two problems lie ahead:

. . . Excess runs by refiners.

Crude prices cannot rise if excessive refinery runs continue to make a shambles of product prices.

Russell suggested that refinery runs be held 5% lower than the refinery division normally plans. This level of operations would be fair both to the industry and to the consumer.

. . . Excessive capital expenditures in production.

Large capital economies could result if the drilling industry held back all development not needed for producibility, Russell said. He cited widest possible spacing as another avenue of capital economy that should be stressed to the utmost.

Even with economies, Russell estimated that capital expenditures for production in the 1958-68 decade will total $50-55 billion and should reach $7.1 billion in 1968.

Top management bears a heavy burden in controlling what goes on in refinery and marketing, Russell said.

Even if a refinery manager can cut his unit costs 5 cents a barrel through operating at capacity, he gains nothing for his company if it loses 20 to 25 cents a barrel through resulting price declines.

Russell observed it will take mature self-restraint to restore the oil industry's earnings potential and return it to favor with the investing public.

He summed up the outlook like this: "You cannot expect anything so good as the first 10 postwar years through 1955, but you can expect something much better than the 10 years ended in 1958.

"The investor is not going to favor this industry until it shows renewed earnings growth and the capacity to extend that growth."

API Mourns Death of Bill Boyd

API DIRECTORS last week took formal note of the passing of William R. Boyd, Jr., who headed the API for 8 years and served as executive vice president for another 12 years.

Boyd, 74, died in his sleep November 6 at his home in Teague, Tex. He started his career there as a lawyer after being admitted to the bar at the age of 19. Two years later when the town was incorporated, he became its first mayor.

Boyd retired 10 years ago after spending 29 years with the API.

He joined the API in 1920, soon after it was formed, as assistant general secretary and counsel. He was elected executive vice president in 1929 and president in 1941. He retired in 1949 but was an honorary API director at the time of his death.

Boyd was elected chairman of the Petroleum Industry Council for National Defense at its first meeting the day after Pearl Harbor. He continued to head the organization when its name was changed to Petroleum Industry War Council. He also served as national director of the president's rubber-collection drive in the summer of 1942.

In 1946 he was awarded by President Truman the Medal for Merit, the highest civilian decoration, for his services to the United States and its allies. The citation described the Petroleum War Council as "the greatest government-industry partnership in the history of the United States."

In the resolution, the API directors described Boyd as "a man who was both liked and admired throughout the oil business, and whose record of character, achievement, and patriotism makes oil men proud that he played such an important part in their industry."

Theodore Shabad . . .

. . . soon a big surplus for export to the free world.

Russia May Be Big Exporter by '65

• It's giving crude-oil production high priority and will probably hit its 1965 goal of 4,500,000 bbl. a day. If it decides to sell it abroad, and if per capita use doesn't soar, it will be a big competitor in the world market.

RUSSIA will have a big crude-oil surplus for export to the free world by 1965.

It may be as much as half a million barrels a day. How much of this will be offered on the world market will depend on:

. . . **The extent** to which Russia continues to use exports as a tool of foreign policy and to reach its economic aims.

. . . **The effort** made to improve the standard of living in Russia and its resulting effect on demand within the country.

. . . **The success** of present plans for expanding crude-oil production in Russia.

It's likely that production gains will outstrip increases in consumption, with the result that the world oil industry will face stiff competition from the Soviets by 1965.

That's the conclusion of Theodore Shabad, New York Times specialist on Russian affairs, before API members last week in Chicago.

Output during the first 9 months this year averaged 2,500,000 bbl. daily, Shabad said. Russia's present goal is 4,500,000 bbl. a day by 1965, and it is Shabad's judgment that Russia may hit this target.

Crude oil outlook . . . For the past 10 years Russia has been increasing its oil production at an average annual rate of 15%.

It now is three times its average of 758,000 bbl. daily in 1950. And, in a sharp reversal of economic policy, Russia is now giving special priority to oil and gas development.

During the 1959-65 period, Russia plans to double oil production and increase gas output five-fold, while holding coal to a 23% increase.

The policy shift is necessary for three reasons:

. . . **Need to conserve capital** and save on labor.

. . . **Need to relieve** the overburdened railroads by moving more fuel by pipeline.

. . . **Need for firm supply** of raw materials for a modern chemical industry.

The Russians, Shabad said, are confident they can reach their oil-production goals. They've been successful in finding new oil and gas reserves. They can expand labor force to do the work.

Natural gas . . . Although far behind the U. S., Russia is now in second place as a gas producer.

Its first long-distance transmission line was laid as recently as 1943, and its present 7,500-mile system is still in its infancy, Shabad said.

But the present 7-year plan calls for construction of 16,000 miles by 1965. Principal markets are industry in Moscow, Leningrad, the Ukraine, and the Ural Mountains, all of which have suffered fuel shortages in the past.

The Russians expect to make real savings by using gas to displace long-haul coal shipments. To make the move even more economical, Shabad said, the Russians are planning to use

40-in. transmission lines, beginning this year.

Gas also is expected to be used more and more as a household fuel, displacing firewood, kerosine, and coal. By the end of 1965, about 20% of Russian homes will be heated by gas.

Petrochemicals . . . Russia's synthetic rubber industry, now based largely on grain and potato alcohol, is slowly shifting to refinery gases as raw material.

As oil and gas become increasingly available, they are opening up a whole new field of petrochemicals for making fibers, plastics, and detergents.

Export outlook . . . In 1950, Russian exports were 22,000 bbl. a day, or 3% of domestic production. And more than 80% of this went to other Communist bloc countries.

Last year, exports were about 360,000 bbl. a day, or 16% of production, and more than half went to countries outside the Communist group.

As Russia steps up its production sharply in the years ahead, Shabad said, the 200,000 bbl. daily now going to the free world could easily double and might well reach 500,000 bbl.

A key factor will be the rate of growth in per capita consumption within Russia.

However, he said, it has been made quite clear that there is no plan to increase the use of energy by the average citizen. The big increases in domestic oil use will be in industry.

For this reason, Shabad said, Russia will have a large exportable surplus by 1965—if it is able to reach its expansion goals. And, he said, he thinks Russia can.

Harris Names Terms for New Gas Bill

- White House must ask for it, and industry must be in agreement, he tells transportation group.

REP. OREN HARRIS has thrust squarely upon the White House the responsibility for action on a bill to clarify gas-industry regulation.

The Arkansas congressman, departing from his prepared speech before the API Division of Transportation, said he had no intention of considering gas legislation next year under the present circumstances.

"The administration from the top must speak out forthrightly and urge its enactment," he declared.

Harris is chairman of the House Committee on Interstate and Foreign Commerce and was author of the last bill to modify federal regulation.

Harris said the regulatory situation is "much worse and more serious today," than a few years ago.

He warned that if it is not cleared up, the consumer eventually will suffer the consequences of higher costs and a shortage of gas. "And the oil industry will become more and more a public utility regulated by the government," he declared.

In addition to backing from the administration, Harris called for:

. . . **The pipeline and coal** interests to resolve their differences.

. . . **Distributors** to take a leading role and a different attitude toward industry cooperation and to agree on legislation to bring order beneficial to the industry and public alike.

"These are my terms for bringing about constructive and badly needed action," he said.

REP. OREN HARRIS, left, chats with Charles E. Spahr, president of Standard Oil Co. (Ohio). Harris spoke at a Division of Transportation meeting presided over by Spahr, who is retiring this year as vice president of the division.

Elkins amendment? . . . Harris mentioned briefly a bill before his committee relating to amendment of the Elkins Act of 1903 as it applies to pipelines.

But he expressed uncertainty whether such a bill proposing divorcement of oil pipelines from integrated-company operations would be considered in the next session of Congress.

Agency bills . . . Harris gave high priority in the next Congress to bills to correct questionable relations between staff members and commissioners of agencies such as the Federal Power Commission and those who appear before them.

"The pressures, generally by ex parte communications between commission members and personnel on the one hand, and interested persons or institutions on the other, constitute perhaps the greatest obstacle to the achievement of the highest order of performance in the administrative process," he said.

Harris at this point again departed from his text to include members of Congress among those who have been guilty of "ex parte communications."

He said legislation will be considered to:

. . . **Guard against improper** influence upon agencies and against improper conduct by members and employes.

. . . **Insure proper ethical** standards by agency-connected personnel and parties on proceedings before them.

. . . **Prohibit secret communications** to agencies relating to current proceedings.

R. B. Jacobs

O. A. Pipkin

T. L. Smith

Refining Group Studies What's New in

ALMOST all flammable gaseous hydrocarbon-air mixtures can detonate, or explode, in a particularly violent way. And flammable hydrocarbon mists in air will also detonate.

These points represent new thinking about hydrocarbon explosions, said R. B. Jacobs, Indiana Standard's manager of engineering research, as he keynoted a forum on operation safety.

Until recently it was thought that gaseous detonations were largely confined to such mixtures as hydrogen or unsaturates in air or oxygen, or saturates in oxygen. However, it was known that saturated hydrocarbons and air would detonate if they were in a highly turbulent condition.

"We do not know precisely under what conditions any mixture will detonate," he said. "But we do know that major disasters due to hydrocarbon detonations have been more frequent in recent years.

"And an examination of the conditions leading to this type of explosion indicates that large modern installations with long pipe runs, large vessels, and high-velocity vapor lines are more susceptible to these explosions.

"However, old process units and small equipment are also susceptible," Jacobs said.

Disasters can be avoided only by carefully guarding against all conditions which can result in the presence of flammable mixtures within operating units. If air, or oxygen, must be used in the refining process, its concentration in hydrocarbon mixtures must be known at all times and must be rigorously controlled, he said.

General conditions . . . Apparently if a high degree of turbulence is present, the intensive shock waves which characterize a detonation develop quite easily.

Danger of detonation is increased if unsaturated hydrocarbons or hydrogen are involved, or if the air is enriched with oxygen.

Also, higher pressures and lower temperatures promote detonations. Conversely, a depletion of oxygen or a higher temperature or a lower pressure make detonations more unlikely, Jacobs said.

What happens . . . When a detonation takes place, burning proceeds with such speed that there is practically no time for mixing or equalizing pressure.

Pressure piling and discontinuous shock waves are the essence of a detonative type of explosion, he said.

There are three characteristics of a detonative explosion that make it particularly destructive:

. . . It produces a peak pressure which may be as much as 20 times the peak pressure produced by a normal explosion.

. . . The detonation front travels at supersonic velocities, which makes pressure-relieving devices useless for the most part.

. . . A directed blow, rather than a hydrostatic force, results from a detonation. This directed blow is often particularly damaging.

If a detonation occurs, the walls of a weak vessel may not have time to fracture and get out of the way before they are hit a devastating blow by the oncoming pressure-shock wave.

Pressures may differ widely at different locations in an enclosure subjected to internal detonation. On one instance, pressure at a point only 25 ft. inward from the open end of a pipe was sufficient to rupture the pipe (about 6,000 psi.).

This emphasizes the futility of relief valves or other pressure-relieving devices against detonative explosions, Jacobs said.

Older units, too . . . Older units are not immune to detonations, said O. A. Pipkin, Cities Service Oil Co. Pipkin was speaking from experience.

On January 22, 1959, a detonative explosion in a Dubbs coking unit rocked the Cities Service refinery at Ponca City, Okla.

Two side-by-side Dubbs units had been operated over 30 years and had been brought on stream about 6,000 times without mishap, Pipkin said.

This fine safety record was shattered because of operator error and subsequent failure to detect that error.

During the filling operation in the startup sequence, the vent valve from the top of the dephlegmator downstream from the coking chambers was not opened. When open, this vent pro-

Complete texts of two of the papers on detonative explosions are carried in full in this issue. The R. B. Jacobs paper begins on page 145. The paper by O. A. Pipkin begins on page 149.

D. W. Schmitt

Explosions

vided for the escape of air as the unit was filled with oil.

At the time of detonation, gas temperature near the surface of the hot liquid in the dephlegmator was about 500° F., and pressure was about 250 psi. Ironically, two operators had discovered the closed vent valve and were about to open it when the explosion occurred, he said.

Analysis of the explosion leads to these conclusions:

... **Detonations** can occur where air is present through faulty purge procedure or any other cause.

... **Startup procedures** for old units should be reviewed in light of the latest technology. Each change in startup procedure should be studied for even the remotest combination of circumstances which might result in hazardous conditions.

... **The problem** of human error, even with the most experienced operator, still exists. This offers a challenge for better training techniques.

Watch air compression ... Detonative explosions can occur in high-pressure air compressors if seal or lubricating oil is not kept out of contact with the compressed air.

This point was made by T. L. Smith, ballistic research laboratories, Aberdeen proving ground; and D. W. Schmitt, Ingersoll-Rand Co., Phillipsburg, N. J.

A centrifugal compressor was on test at the Aberdeen wind tunnel when it detonated. It was operating at 250 psi. suction and 750 psi. discharge at the time, Smith said.

The shaft-seal control on the seal-oil system, though adequate for normal operation, was inadequate to handle transient starting conditions. Oil leaked into the compression chamber and encountered high-pressure air at a temperature of more than 400 degree F.

Steps needed to prevent recurrence of the disaster are:

... **Solvent wash** of all lines before starting operations when oil contamination has occurred.

... **Redesign** of the shaft seal to prevent leakage of oil into compression chamber.

... **Automatic detection** system for oil droplets.

... **Regular check** of piping drain points.

A centrifugal compressor, designed for compressing natural gas in oilfield repressuring, detonated while on test at Ingersoll-Rand's Phillipsburg plant, Schmitt said.

Definite evidence of a combustion-type explosion shows that enough lubricating and seal oil to produce an explosive oil-air mixture had entered the system. Also, oil had been found when blowing out low points in the piping between test runs.

Suction air pressure was 550 psi., and air temperature was about 400° F. at time of detonation.

Some of the conclusions reached by the investigating committee are:

... **Compressor** test loops, whether in the field or in the factory, should be built and operated so that at least one of the three elements of the combustion triangle (oxygen - fuel - heat) will be eliminated.

... **When testing** high-speed rotating compressors, it cannot be assumed that a source of high temperature or ignition can be eliminated.

... **Recording instruments** should be used to keep close check on compressor speed, discharge temperature, and cooling-water flow.

... **Inert gas** should be used in testing compressors with oil seals or with negative intake pressure where lubricating oil might enter the compression chamber, Schmitt said.

PIPELINERS elected L. H. True (seated to the right of lectern), Magnolia Pipe Line, president of the Pipe Liners Club at the annual API banquet. He succeeds J. M. Linehan, Sunray Mid-Continent. Harry Moreland, Great Lakes Pipe Line, was elected vice president to succeed True. At the head table, left to right, are Bruce C. Clardy, B. C. Pipe Line; W. H. Morris, Sinclair Oil & Gas; C. R. Musgrave, retired from Phillips; J. L. Burke, Service Pipe Line; Fayette B. Dow, Committee for Oil Pipelines; R. K. Paine, Standard of California; Earl W. Unruh, Sinclair Pipe Line; John W. Emison, Texas Pipe Line; J. L. Irvin, Gulf Refining; Linehan; True; D. F. Sears, Shell Pipe Line; W. C. Kinsolving, Sun Pipe Line; C. S. Mitchell, Cities Service; Loren F. Kahle, Standard of Jersey; J. L. Latimer, Magnolia Pipe Line; Moreland; R. H. Lynch, Atlantic Pipe Line; G. H. Supple, General Petroleum; and Oliver Klinger, Jr., Pipe Line News.

Supplee to Head API Transportation Division

• President of Atlantic Refining Co. succeeds Spahr as head of API's many transportation activities for 1960.

Henderson Supplee, Jr.

THE API reached outside its Division of Transportation for the new vice president of the division—Henderson Supplee, Jr., president of Atlantic Refining Co.

Supplee succeeds Charles E. Spahr, president of Standard Oil Co. (Ohio), who completed 2 years in the post by presiding at this session.

"I came in through the back door by way of the API board of directors," Supplee commented. "Since petroleum transportation involves all forms, I suppose they desired a vice president with over-all responsibility rather than one with experience in pipelining or one of the other divisions."

The new API transportation boss will be directing a very active division of the industry organization, one with dozens of committees engaging in everything from research to keeping up with government law and regulation. An observer at these committee meetings is impressed with their effectiveness in developing standards and exchanging technical information to the benefit of the industry and public.

Supplee is a native Philadelphian who is still working in and promoting the city of his birth when he isn't furthering the interests of Atlantic or API. An urbane Princeton man, who keeps trim through fishing, golf, and horseback riding, he is a relative newcomer to the oil business.

He joined Atlantic in May 1947 as vice president and general manager of domestic sales after resigning as president of Supplee-Wills-Jones Milk Co., Philadelphia, with which he had been associated for 20 years.

In May 1948 he was elelcted a director and a year later became executive vice president. He was elected president of Atlantic in May 1952.

He is a trustee of Princeton University, a director of Old Philadelphia Development Corp. and the National Industrial Conference Board, co-chairman and director of the Greater Philadelphia Movement, chairman and federal reserve agent of the Federal Reserve Bank of Philadelphia for 1958-59, director and member of various API committees, and a member of the National Petroleum Council.

Scholl Asks Highway Study as Tax Defense

A CONCRETE example of how the API's new Committee on Public Affairs is handling a specific industry problem is the increase in federal gasoline taxes.

This year's increase was wrong, and every effort should be made to see that it expires as scheduled at midnight, June 30, 1961, the CPA was told by Robert H. Scholl, vice president of Esso Standard Oil Co. Just taking that stand is not enough, he said.

The industry must work with other interests in developing satisfactory solutions to what Scholl called the "highway dilemma."

The so-called interstate highway program, he said, has got out of hand, is not working out as originally conceived, and is raising serious doubts as to its objectives and procedures.

The oil industry's active participation in reviewing and revising the program, Scholl said, has three reasons:

... **The industry** is cost conscious and wants to see efficiency and good return for money spent.

... **The industry** is inflation conscious and wants to offset all forces tending to increase costs and prices.

... **The industry** is bearing the major portion of highway financing to the point where gasoline prices plus taxes threaten to reduce consumption of motor fuel.

The way to reverse the upward movement of gasoline taxes, Scholl said, is for the oil industry to cooperate in objective studies with a view to answering such questions as:

... **Is the total** estimated cost of the program now too high for the nation to afford?

... **Are construction** standards in sparcely settled regions unnecessarily luxurious for the volume and nature of the traffic anticipated?

... **Is too much** of the money being spent for urban expressways rather than interstate highways?

... **Are other interests,** such as adjacent land owners, benefiting more from the program than motorists?

... **Should** the federal Government finance 90% of every portion of the program, particularly urban sections?

... **Why should gasoline** bear 80% of the cost of the greatest public-works program in history?

Robert H. Scholl

... **What other sources** of revenue logically can and should be provided when Congress next considers the highway program?

Steel Outlook: Plenty in 90 Days

• Back-to-work order came in the nick of time for the drilling industry, but there still will be a delay in getting pipe. Orders made now probably will be filled in the first quarter of '60. Price increase is still in doubt.

NEW STEEL goods will start moving out to the oil industry in a month or 6 weeks.

Here's the outlook revealed by checks throughout the industry made by Oil and Gas Journal editors:

... **Orders placed last June,** July, and August probably will be filled in December and January.

... **Orders placed now** will be filled by late in the first quarter or early second quarter.

... **Stocks** are nearly depleted for deep-drilling casing, slim-hole supplies, and most line pipe.

What's involved . . . Oil-industry buyers attending the API session in Chicago got a good briefing on the steel outlook.

John E. Timberlake, vice president of sales for Jones & Laughlin Steel Corp., said once the mills get rolling "they can and will produce oil-industry pipe at a much higher rate than the oil industry plans to use it."

He said the industry can expect a regular organized schedule of shipments from the mills in about 60 days.

"If a mill happens to have a supply of tube rounds for a given size and grade, you may be able to expect earlier shipment in seamless pipe," he said.

Striking steel workers went back to work last week when the U. S. Supreme Court upheld the Government's Taft-Hartley injunction.

Timberlake explained the first job in the mills is a staggering safety program. Workers must check power lines, steam lines, hydraulic systems, motor and oil bearings, and lubrication systems.

"There will be very small amounts of new steel tapped in the first 10-day period," he said. "A real start is made in the 10-day to 2-week period. At the end of 30 days, our ingot rate will be 80 to 90%—ingots not product."

J&L's John E. Timberlake
... regular shipments in about 60 days.

More strikes . . . Steel men attending the API expressed belief a settlement will be reached during the current 80-day cooling-off period.

The steel union men are back in the plants under the same contract, rates of pay, and other working conditions existing prior to the strike. Negotiations between union and management representatives will continue during the 80 days for a new contract, however. Before the end of this period, a secret ballot may be taken among the workers on the strike issue.

Majority of steel men feel that under a secret ballot the workers will not vote to strike again. They expect a settlement before the election is held.

Inland Steel Co. announced last week it has made an offer to the steel union for a 3-year strike-free agreement involving wage increases and other benefits averaging 10 cents per hour each year or 30 cents over life of the contract. Others most likely will be making similar offers soon.

The shortage . . . The oil industry actually made out better during the steel strike than many others.

But the drilling segment of the industry already was facing up to some real trouble when the workers were ordered back.

West Coast suppliers reported, "We're broke on popular size tubular goods."

The West Coast supply houses report a strange predicament. They have 7-in. casing in abundance. Major operators also have a heavy stock of the item and even have tried to sell it off to other operators without success.

One supply house executive reported a fantastic drop in demand has occurred for 7-in. casing in the last 4 or 5 months. He attributed the trend to desire by operators to cut costs with slim-hole drilling. The most popular pipe—and one nearly impossible to find on the West Coast now—is 5½-in.

If the strike had lasted much longer, however, operators might have been forced to use the 7-in. casing in order to drill any wells.

Gulf Coast outlook . . . Suppliers along the gulf agree stocks are depleted for deep-drilling pipe and most smaller size tubular items.

Other oil country supplies, such as machinery, couplings, christmas trees, etc., have not been hurt during the strike.

One major supplier described his stock as containing only "cats and dogs." He admitted the squeeze won't clear up overnight. "We got an order today from a major for January delivery," he said, "But we can't fill it."

Another gulf supplier said the real

pinch came last month and predicted at least another month of tight market before supplies start rolling.

Many supply people report there have been some actual drilling shut downs because of the shortage. This is especially true for deep wells in Louisiana. The operators in some of these instances had emergency supply of pipe but didn't want to use it on a new well. In most cases the independent has been able to come up with the pipe with proper hustling or borrowing.

The mid-continent . . . Supply houses report they're in bad shape on tubular goods. The companies, meanwhile, weathered the crisis but are anxious about their future deliveries.

Typical supply-house comments in the mid-continent area:

"We're in bad shape . . . We're having to start from scratch to build up our inventories."

"I don't know what the situation is. It'll be several days before we know out here what the mill schedule will be."

"Our future deliveries depend on everything going smoothly at the mills during this 80-day period."

"We aren't able to promise our customers any delivery date. The mills have to worry about getting back into production. Their managers have ulcers enough trying to start production without having to promise a target delivery date."

The oil companies claim they are in good shape. Most probably are for the moment, but their purchasing agents are busy trying to determine what prospects are for delivery or orders placed before the strike began. This knowledge is important to plan projects for the rest of this year and make up budgets for 1960 work.

Many companies have operated under a steel-conservation program for weeks. They only started a project if all the steel needed was on hand.

The future . . . No one in oil or steel at the moment is talking about increased steel prices.

What happens to prices, naturally, will depend on the final labor settlement. Steel has based its entire case in the strike on its determination to hold down costs and increase efficiency so it would not have to increase prices to its customers.

Some sort of wage increase is almost certain. The Kaiser settlement indicates that. If management is able to offset this with union concessions on conditions that lead to greater efficiency, a price increase may not result. However, historically when steel costs rise, they are passed on to steel customers.

The long-term outlook for steel prices is up, as remarks of Jones & Laughlin's Timberlake indicate. He said the steel industry's present capacity to make oil-country pipe will meet needs through 1965. But the dilemma is how to finance growing costs of replacing worn equipment.

He said the steel industry's 1958 investment per ton of capacity is $88. Replacement capacity for the 1960's will cost $250 to $300 per annual ton of ingot capacity if inflation holds to its present degree. Present profit margins are inadequate to cover this replacement cost, he said.

However, getting the steel and not its price is the problem at the moment.

Editors of Iron Age give this formula of how to operate during the steel pinch: "Keep on your suppliers' back . . . Order ahead and see that it's recorded . . . Plan for substitute sizes, grades, and types of steel . . . Don't start project until you have steady supply . . . Try new suppliers . . . Keep plugging if you expect to get your share of the thin supply in months ahead."

Trans-Canada Maps 3-Year Expansion

● Looping, more compressor power needed to move gas to TGT in New York, Midwestern in Wisconsin. Target is almost 1 billion cubic feet daily.

A $162-MILLION expansion is planned by Trans-Canada Pipe Lines, Ltd., over the next 3 years.

The projected enlargement of facilities will give Trans-Canada a capacity for the 1962-63 winter of 957,400,000 cu. ft. daily out of Burstall, Sask., its point of origin on the Alberta border.

The pipeline phase of the expansion will involve laying 464 miles of looping on the 575-mile 34-in. Burstall-Winnipeg, Man., western section. In addition there will be the 50-mile 30-in. lateral from Winnipeg to Emerson, Man., on the U. S. border in connection with the export to Midwestern Gas Transmission Co. in the U. S.

Compressor additions at new and existing stations will total 172,600 hp.

The new plans disclosed before the Alberta Oil and Gas Conservation Board are more ambitious than Trans-Canada envisioned at this time a year ago.

1960 expansion . . . Some $45,730,000 will be spent in 1960 on the Emerson lateral, 65,000 compressor hp., and 74 miles of 34-in. loop.

This is, of course, contingent upon approval of an export permit for 204,000,000 cu. ft. daily to Midwestern by the National Energy Board and the Canadian cabinet. The FPC has already approved Midwestern's facilities necessary to import the gas (OGJ, Nov. 9, p. 104).

Trans-Canada plans three new 13,600-hp. stations at Swift Current, and Indian Head, Sask., and Portage la Prairie, Man. A 3,400-hp. unit will be added at the Burstall, Caron, and Moosomin, Sask., stations. A 7,500-hp. station and a 5,000-hp. station will be built and a 2,500-hp. unit will be added at another station.

The capacity at the end of 1960 construction will be 701,600,000 cu. ft. daily out of Burstall and 430,600,000 cu. ft. daily east of Winnipeg.

1961 expansion . . . In 1961 the emphasis will be on looping, with 268 miles of 34-in. planned and 52,200 hp., again mainly at new stations.

There will be a new 10,000-hp. station, three 7,500-hp. stations, and a 4,500-hp. station. Additions include 3,400-hp. units at one station. 2,500-hp. units at three stations, and a 1,800-hp. unit at another.

Capacity out of Burstall then will be 841,100,000 cu. ft. daily and east of Winnipeg, 548,500,000 cu. ft. daily.

1962 expansion . . . The third year of the planned expansion provides for 122 miles of 34-in. loop and 54,400 hp.

Horsepower programs call for single stations of 3,000, 5,000, 6,000, 7,500, and 10,000 hp. Eleven stations will be expanded by 22,900 hp. total.

The 1962 expansion presumes the export of 163,800,000 cu. ft. daily into the U. S. at Niagara Falls, N. Y., for sale to Tennessee Gas Transmission Co. Capacity from Burstall would be 957,400,000 cu. ft. daily and east of Winnipeg, 646,300,000 cu. ft. daily.

Boyer Says $1 Invested in Research Earns $5

- Jersey Standard director gives strong testimonial for research in speaking at dedication of Esso Research's new center in Florham Park, N. J.

RESEARCH and engineering are paying off handsomely for Standard Oil Co. (N. J.).

It estimates, for example, that the 245,000-bbl. refinery at Fawley, England, which went on stream in the early 1950's, could have been duplicated 5 years later at 70% of the original cost.

This was one of several startling figures given by Marion W. Boyer, a Jersey director, at the dedication of the Esso Research & Engineering Co. center at Florham Park, N. J. Boyer credited the cost reduction to new techniques developed in intervening years.

Rising prices and inflation would have all but cancelled the saving, Boyer admitted. But it does not alter the basic fact, he continued, that research and engineering technology reduce capital costs by about 5% per year.

It has been the company's experience, he said earlier, that "every dollar spent to develop new products and improve technology earns approximately $5 in return."

Jersey affiliates have undertaken the construction of 24 refineries since World War II. In the last decade alone they have spent $1.7 billion for refining equipment.

Boyer gave an idea of the tremendous effort involved in developing a new process. Some 4 million man-hours went into the development of the first fluid catalytic cracking unit. Since then some 6 million man-hours have gone into improving the process. The effort paid off—fluid catalytic cracking accounts for 70% of all cracking capacity today.

Where savings made . . . How these engineering studies are being applied was described by John W. Packie, aide to C. E. Paules, vice president for engineering.

The last four refineries built by Jersey affiliates use air cooling exclusively. The saving over the use of water cooling amounts to about $1.5 million per refinery.

Since service facilities represent up to two-thirds of the cost of a new refinery, Jersey is striving to reduce the complexity and cost of offsites. Service facilities such as tanks, buildings, and docks take up a lot of space and cost more than processing facilities.

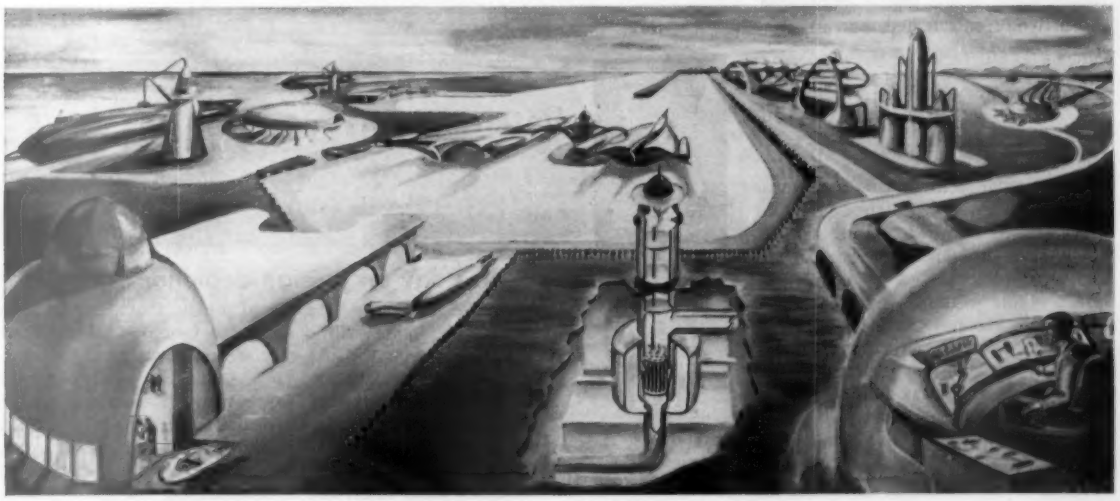
In a simplified, theoretical 100,000-bbl. refinery, Jersey estimates it can save 50% of the total cost of offsites by integrating processing units and utilities into a single unit. The overall savings, it finds, are "over 35% as compared with a more conventional plant."

"During the past year we have developed new design criteria for storage tanks which reduced their cost by 10 to 15%. In some instances we now do away with tanks and use earthern pits for certain product storage with savings up to 70%. On lighter products, which require pressure storage, underground caverns are now being used with savings up to 70%."

The future . . . Those are some of the things Esso Research & Engineering has accomplished. And here's what Packie sees for the future:

"The trend toward more compact, highly integrated processing facilities will most certainly continue. It also appears that greater effort and capital expenditures for heat conservation in refinery processing will take place in the coming years.

"Corrosion of metals is both expensive and wasteful. The use of plastics and other synthetic construction materials will find increasing application. The application of the relatively new techniques of operations research, product stream analyzers, and in-plant computers is also gaining momentum and should find widespread use."



REFINERY OF THE FUTURE: Speculation on what the oil refinery of the year 2075—or the late twenty-first century—might be like is graphically depicted in this oil painting exhibited at the formal opening of the Esso Research's new Florham Park, N. J., research center. In the center, with earth cut away, is a nuclear reactor to provide heat, steam, and electric power. Two giant cargo nuclear-powered submarine tankers are pictured at the far left. Top center, air cargo planes are being fueled. Electronic computers, with operators shown at lower right, will command push-button control of the processing center. New products—still to be discovered—will be made by such plants a century ahead.

Professors Tee Off on Depletion

- Heated opposition to 27½% rate is shaping up as House ways and means committee gets more reports for hearing which opens December 1.

THE PANEL discussion before the House ways and means committee December 1 on oil and gas percentage depletion is likely to develop into the sharpest clash during the committee's over-all tax hearing.

The wide differences of opinion are evident in papers already presented to the committee and made public last week. They range from all-out attack on the practice to staunch defenses of it.

There are differences in views of other tax subjects to be covered by the committee, too, but none are likely to generate as much heat.

The sharpest criticism of percentage depletion comes from several professors who were asked to submit their written views on the subject.

For example, Horace M. Gray, professor of economics at the University of Illinois, makes this blunt statement in his paper:

"The depletion allowance is fraught with so much evil and is so devoid of merit that it should be discontinued forthwith as an instrument of public policy."

He does say that, in principle, the depletion allowance "is perhaps no worse than other tax privileges of the same genus." However, he continues, it is larger than some others, more conspicuous, more highly publicized, more firmly entrenched, and involves more people.

"Its magnitude and consequences serve to endow it with a certain special status and notoriety as the bellwether among all tax privileges," Gray contends.

"Realistically, then, Congress must either deal first with the depletion allowance or acknowledge its inability to make significant headway toward tax reform."

His fault finding includes these charges: It violates the ideal of social justice in taxation, impairs the principles of progressivity and ability to pay, and shifts the tax burden in part to nonprivileged taxpayers.

Furthermore, Gray says, it has these adverse economic consequences: It results in a misallocation of resources by stimulating excessive and unnecessary investment, it begets governmental intervention, sets the stage for further tax privileges, wastes natural resources, concentrates wealth and income and economic power, and results in unbalanced economic growth.

Professor John A. Menge of Dartmouth College looses an equally vigorous assault on percentage depletion.

"There is every indication that the oil industry without duplicative cost deductions in the guise of the depletion allowance, can compete successfully and contribute its rightful share to future productivity in the United States," Menge argues.

Menge concludes that if the oil industry, or any other industry, requires special assistance, "it is preferable to make use of such direct aid as subsidies rather than to go around Robin Hood's barn."

Study needed . . . Some of the other panel members, while not advocating an outright end or cut in percentage depletion, urged a careful study of the subject.

Peter O. Steiner, professor of economics of the University of Wisconsin, simply claims that enough is not known of the specific impact of the percentage-depletion provision.

He urges caution. "To risk destruction of adequate reserves or capacity by ill-considered reduction of the stimulus would be false economy," he says. "If, on the other hand, depletion provisions have little effect or have effects of little national value, any program of special incentives is difficult to justify."

He winds up with this observation:

"We have had decades of arguments . . . about percentage depletion. It is not further views of interested persons that are needed, but the formulation of the relevant questions and a factual determination of the answers to these questions."

Charles O. Galvin, professor of law at Southern Methodist University, also suggests that further careful study is needed.

"The matter will continue in ferment for 50 more years unless we resolve to grapple with the problem once and for all on a rational rather than an emotional basis."

Suggests limits . . . Harry J. Rudick, a New York attorney, thinks percentage depletion should be retained, but with limitations.

"I would require that once a taxpayer's investment has been recovered, no further depletion will be allowed. I would further provide that if property subject to depletion allowances is sold for more than its basis (adjusted cost, etc.), the gain should be taxable as ordinary income rather than

watching WASHINGTON

Clyde La Motte

• Strategy on foreign depletion . . .

IT IS generally considered likely that foes of percentage depletion will concentrate much of their attack at this point on the use of the incentive by U. S. companies operating abroad.

The apparent strategy is that an effort to end, or reduce, foreign percentage depletion offers the best chance of success. That success, if achieved, could set the stage for an all-out drive to lower the domestic percentage.

Companies interested in maintaining the present scale abroad are mapping counter strategy to blunt this attack.

One of the points that will be stressed is that oil companies have contributed greatly to the development of the economies of many nations abroad. They have built schools, hospitals, water systems, roads and various other projects which affect the people of those nations.

capital gain (except where the sale is part of a doing business)."

A strong defense of percentage depletion is made by Richard Gonzalez, Humble Oil & Refining Co., and by Scott Lambert, Standard Oil Co. of California. (A summary of their papers was presented in the November 9 issue of the Journal, p. 102.)

Percentage depletion was also touched on, usually unfavorably, in other papers dealing with tax problems generally.

Several mining industry officials discussed percentage depletion as it applies to their industries. Generally, the tone of their papers was that the provision needs to be strengthened, rather than weakened, if their industries are to be able to provide the increasing demand for their products.

Long session . . . The panel discussions on the various aspects of the nation's tax structure start this week and will continue through mid-December.

After the panel hearings are ended, the ways and means committee will seek to draft tentative proposals for tax revisions. If and when these proposals are made, further hearings will be held on the specific changes suggested.

As Rep. Wilbur D. Mills (D.-Ark.), chairman of the committee, has pointed out, the study will be a lengthy, detailed one. It will likely be many months before any concrete legislative proposals are drafted.

Meanwhile, there is little doubt that the panel hearing on percentage depletion will fan anew the controversy over that tax provision.

U.S.-Canada Gas Pact Urged

. . . by joint study committee on across-the-border movement of natural gas. Report outlines basic points.

A TREATY between the U. S. and Canada, establishing basic principles, would be beneficial in promoting a freer exchange of natural-gas supplies between the two countries.

That is the chief recommendation in a report issued last week by the National Planning Association (U.S.) and the Private Planning Association of Canada.

The report was drafted by a Canadian-American committee appointed to study the problem of across-the-border gas movements. The title of the report is "Wanted: A Working Environment More Conducive to Canadian-American Trade in Natural Gas."

Noting that controversial issues are involved in finding a mutually acceptable framework for expanding trans-border trade in natural gas, the committee urged that a joint effort be made to provide flexible solutions.

"If a substantial measure of agreement could be reached, we suggest that this agreement should be given binding expression by both Ottawa and Washington," the committee said in its report.

The committee suggested four fundamental principles upon which a sound and beneficial growth in trade in natural gas should be based. These points were:

. . . Prices. Any prices decided upon by both the exporting and importing utilities and approved by the proper authorities in the country of origin should be accepted as given.

"The committee sees no purpose to be served by costly investigations which look beyond international boundaries."

. . . Reserves. Arrangements should be made to set aside reserves "sufficient to look after the reasonably foreseeable needs of each country," the committee said.

. . . Supply. The exporting country must be prepared to guarantee continuity of supply to the best of its ability for periods of time which are clearly stated in advance.

. . . By-products. Such by-products of natural-gas production as cannot be disposed of locally should also enjoy relative freedom of movement either way across the border.

The committee has about 60 members, representing business, labor, agricultural, and professional interests in both Canada and the U. S. Charles A. Perlitz, Jr., Continental Oil Co., and J. R. White, Imperial Oil Ltd., are included in the membership list.

The committee's report is another indication of the growing concern over potential problems ahead in the movement of increasing quantities of natural gas between the two countries (OGJ, Oct. 26, p. 50).

If percentage depletion is cut, these companies say, they will have less money for such projects. As a result, underdeveloped countries might very well seek an increase in foreign aid from the U. S.

Thus, say the tax proponents, most or all of the additional taxes the U. S. would gain from a percentage depletion cut would be offset by increased taxes on other taxpayers to pay for the increased foreign aid.

They are sure to point out to the administration and to congressmen who support the foreign aid program the seeming inconsistency of taking away private "aid" while trying to justify governmental aid.

Another point of their planned defense is this: There was a drive under way this year to pass legislation to stimulate foreign investments abroad. Surely supporters of that legislation could not justify a cut in foreign depletion for that would tend to discourage oil investments abroad.

• Impact of firms operating abroad . . .

A SURVEY is now being made by an independent organization which may shed some light on the impact of U. S. oil operations abroad.

The American Enterprise Associations, Inc., of Washington, D. C., has sent questionnaires to U. S. oil firms operating in underdeveloped countries abroad.

The questionnaire covers such items as the company's expenditures abroad, money spent to develop community facilities, funds spent in training native personnel, etc.

Since the association makes its reports available to congressmen and others, the current study may wind up as part of the record in congressional hearings on the subject next year. Realizing this, the association hopes to get as high percentage of returns as possible on the questionnaire to help make its report as accurate as possible.

The AEA is classified as an independent, nonpartisan research group which studies national policy problems. Its funds are provided by U. S. business firms but its advisory staff, which directs the projects, is made up largely of college professors—chiefly those specializing in business or economics.

It issued a report earlier this year on "The Question of Governmental Oil Import Restrictions." Chief conclusion of the report, written by William H. Peterson, a New York University professor, was that the current controls program does more harm than good (OGJ, Sept. 7, p. 106).

The Peterson report drew sharp criticism from Russell Brown, IPAA's general counsel, who said it was incomplete and misleading in many respects.

Study of Ratable Take

. . . planned by New Mexico association. Legislation will be offered if study shows tighter controls are needed.

INDEPENDENT operators in New Mexico, warned of an alleged large loophole in the state's ratable-take laws, have decided to make a thorough study of those laws.

Directors of the Independent Producers and Royalty Owners Association of New Mexico have instructed the group's new president, Bob McPheron, Hobbs, to appoint a committee to consider the possibility of strengthening the ratable-take laws.

Corrective legislation, if needed, would be offered at the next session of the state legislature in 1961.

The association directorship acted following a warning from John Davenport, general counsel of the Texas Independent Producers and Royalty Owners Association.

Davenport told the association at its annual meeting in Albuquerque earlier this month that New Mexico ratable-take laws lacked one fundamental element of protection for the independent—effective regulation of pipelines as common carriers.

Without such statutes, Davenport said, "it is impossible to base your common-purchaser laws properly on the ownership of, or affiliation with, such common carriers by the common purchasers.

"The essential basis for use of the state's police power is therefore lacking. When a state grants pipelines the right of eminent domain, it is not too much to require common-carrier responsibilities."

Such laws are vital to New Mexico, Davenport said, "for New Mexico is skewered on the new Texas-New Mexico trunkline, which pumps some 60,000 bbl. per day of unprorated (and purchaser-owned) crude past New Mexico producers."

Undercut charged . . . Even in those states with the strongest ratable-take laws, Davenport said, there is cause for concern.

The concern, he said, is over a "vigorous and determined drive to weaken or invalidate" these statutes.

"The present world oversupply of crude oil, the shut-in reserve capacity of our domestic oil industry, and the unabated hunger of certain integrated purchasing companies to favor their own production have led to the most determined assault on ratable taking in several decades."

In Texas, Davenport said, common purchasers have found a way to effectively insulate themselves from their responsibilities through the use of "buffer gathering systems." They accomplish this, he said, either by spinning off their gathering system to third-party corporations or by insisting on third-party gathering systems in new fields.

In Oklahoma, where ratable-take laws are even stronger than in Texas, Davenport said, Gulf Oil Corp. has attempted to institute purchaser proration on a basis whereby it would "use its own production 100% by exchange agreements but prorate other production 80%."

The Oklahoma commission has been harshly and unjustly criticized for its firm action to block the Gulf plan on grounds that it would "kill the goose that lays the golden egg" by driving purchasers out of the state, the Texan said.

More studies . . . Along with the ratable-take law study, the New Mexico independents will delve into problems of gas-price discrepancies and unconnected wells.

Association directors ordered that New Mexico operators be queried to develop data to show how serious the unconnected-well problem might be.

The association also plans to investigate the possibilities of obtaining connections to Texas-New Mexico Pipe Line Co.

A third survey will be made of varying natural-gas prices paid to producers over the state.

New officers named . . . The association's new president, McPheron, replaces Vilas P. Sheldon, of Artesia.

Marshall Rowley, Artesia, was named new vice president. And Charles C. Loveless, Roswell, was reelected secretary-treasurer.

B. J. Kellenbarger of Ambassador Oil Corp., Fort Worth, and J. Felix Hickman, Albuquerque, were named new directors.

FTC Still Studying Merger

ANOTHER delay has developed in the Federal Trade Commission's efforts to break up the merger of Gulf Oil Corp. and Warren Petroleum Corp.

An FTC examiner has granted the FTC staff until December 31 to submit a report on its plan for obtaining and presenting additional evidence.

The examiner has also denied Gulf's request that the case be dismissed for lack of prosecution.

The FTC staff's request for more time was based on a proposal to conduct a further survey to determine the extent of the Gulf-Warren merger on competitors.

Merger Stymied

. . . as investor barred in Texas Pacific dealings.

LEHMAN BROS., a nationally prominent investment house, was enjoined via a consent decree issued in Fort Worth last week from promoting in any way a merger of Sinclair Oil Corp. and Texas Pacific Coal & Oil Co.

The consent decree was approved and entered by Judge Jack Langdon, Seventeenth District Court, Tarrant County. It came as a result of an antitrust suit filed by the State of Texas to block a Sinclair-Texas Pacific merger.

Will Wilson, Texas attorney general, hailed the decree as a big step forward in preserving the independence of an old Texas company. Wilson said he could continue to press for action which would force Sinclair to rid itself of its interest in the Fort Worth independent firm.

Lehman Bros. said it was accepting terms of the decree to keep from getting embroiled in long litigation.

These terms provide that Lehman Bros:

. . . is enjoined from bringing about or assisting in any way a merger . . . in violation of the antitrust laws of Texas.

. . . must dispose, as must its partners and their families, of all Texas Pacific stock owned by them on the open market within 120 days.

. . . must transfer any Texas Pacific stock it holds on account for someone else to that person or his nominee within 120 days.

. . . Can not own or acquire directly or indirectly any Texas Pacific stock for 5 years. The same holds true for partners and immediate families.

. . . Partner now holding office as a Texas Pacific director must resign immediately.

. . . May not act as proxy or vote any share of Texas Pacific stock for 5 years and may not solicit the vote of any other person.

Waste Charged by Superior in Aneth Hearing

• Company claims 20% of recoverable oil is being lost on present 80-acre spacing. Water flooding is urged.

RESUMPTION of the Greater Aneth well-spacing hearing at Salt Lake City last week brought forth a claim that extensive underground waste already is occurring there under the present 80-acre spacing.

Superior Oil Co., in a statement presented to the Utah Oil and Gas Conservation Commission, declared present practices are resulting in more than 20% of the recoverable oil being lost. The cure is the immediate start of a full-scale water flood so that present reservoir pressures can be maintained.

The commission refused to broaden the scope of the hearing beyond that of determining whether one well will efficiently and economically drain 80 acres, or if 40-acre spacing is required. Superior, which may be able to present its exhibits this week, is expected to continue to try to bring underground waste into the hearing, however.

The well-spacing debate, which has been under way for almost 2 years, may be concluded by Thanksgiving. It's highly unlikely this goal will be reached though. In any event a commission ruling is not expected before early 1960.

Big stake . . . Something like $50,000,000 is involved in the issue.

With about 500 wells completed, the area is almost entirely drilled except for some Navajo lands which have been withheld from leasing. If 40-acre spacing is adopted, almost this many more will be drilled at a per-well cost in the range of $110,000 to $150,000.

Superior, along with Continental Oil Co., Texaco Inc., Phillips Petroleum Co., and Carter Oil Co., are seeking 80-acre spacing for Greater Aneth. Shell Oil Co. is carrying the load of proving that 40-acre spacing is needed. However, both Gulf Oil Corp. and Standard Oil Co. of California originally backed Shell in this claim.

Texaco's presentation of its exhibits took up most of 2 days last week. These and the supporting testimony dealt mainly with well-interference tests. Wells as much as 2 miles apart showed excellent reservoir interconnection, it was brought out.

Shell will be the last to present its exhibits. These will largely center around data gained from five 40-acre test wells it drilled earlier this year under a special commission order and at a cost of $750,000.

Prime purpose of these wells was to show that "isolated islands of porosity" existed which would remain untouched by an 80-acre well spacing. A 40-acre spacing pattern would result in some 15 to 20% more oil being recovered, Shell claimed, and would much more than pay for the drilling of a second well.

Superior, in the statement it filed with the commission last week, claimed the five test wells "failed to disclose any evidence of virgin reservoir pressures" between wells drilled on 80-acre spacing.

With current Aneth oil production ranging around 90,000 bbl. daily, Superior claimed an underground loss of about 22,500 bbl. daily. Adoption of 40-acre spacing would delay the start of water-flooding operations for 2 or 3 years and would cause this loss to become even larger.

Shell Leases Entire Offshore Mississippi Area

OFFSHORE MISSISSIPPI, a long-neglected potential tideland oil area, soon will get a major testing.

Shell Oil Co. has leased the entire offshore province—from Louisiana to Alabama and extending seaward about 3 miles beyond three major offshore islands. The lease covers 800,000 acres.

The Mississippi Mineral Lease Commission awarded Shell the lease in a two-bid sale. The second offer was made by Louisiana Materials Co., formed by a group of Louisiana and Texas oil men.

In its successful bid, Shell paid a bonus of $80,000. Under the terms, Shell can select as many as 10,000-acre blocks as it chooses during the first or second year. It must pay $5 per year rental per acre on each block it keeps, and the lease is good for 5 additional years. The rent is waived when there is drilling.

At New Orleans, Shell said it plans to start seismic work within 2 months, and drilling will occur after it has done sufficient geophysical work.

H. M. Morse, director of the Mississippi Oil and Gas Board, said that only four holes—all dry—have been drilled in offshore Mississippi. The last one was drilled in 1954 on the west side in St. Louis bay by Willis Hughes on a farmout from Melvin Oil Co., a Benedum-Trees subsidiary.

Morse said the Shell lease extends 3 miles seaward from Cat Island, Ship Island, and Horn Island, all of which are some 10 or more miles off the main shoreline. Whether any of the leased area lies in disputed waters is not known, but Morse said Mississippi was assuming that all of it is within the state's jurisdiction.

State-Owned Autos Will Burn Bargain Gas

AMERICAN OIL CO. will become the sole supplier of gasoline for 3,000 state-owned vehicles in New York.

No formal contract has been signed, but Amoco has agreed to sell gasoline to employes driving state-owned vehicles at 1½ cents off the regular price. Length of the agreement will depend on the experience they have with the operation.

Douglas C. Coupe, director of New York's Division of Standards and Tests, said that it would mean a saving for the state of more than $100,000 per year.

Thereafter, "operators of all state-owned vehicles must confine their purchases to stations selling American products," Coupe said. He added that charges for other brands will not be honored by the controller unless "accompanied by a suitable explanation."

"Persons who purchase other than Amoco without justification will be held personally responsible."

The state announcement said that at least four other companies—Esso, Gulf, Socony Mobil, and Shell—had been offered a chance to participate but declined.

"We hope the others will be coming along shortly," Coupe said.

Other companies say they look on it as unprofitable business.

Experts Tell What Is Ahead for Oil,

• Two panels of top men in energy fields predict what they think the world will demand for the oil and other industries in the future.

THE OIL industry—and all other energy industries—face an era which will develop demands for fuel that almost dwarf the energy needs of today.

Oil and gas may not dominate future energy demands like they do today, but the demand for both is expected to continue to grow. Much depends on what comes out of research labs now developing other sources of energy. Too, oil and gas must remain competitive to stay in the fast-moving energy picture.

There are vast stores of energy available from sources other than crude oil and natural gas. Some of these potential energy industries are in the toddling stages. Others aren't even developed to this point. But it looks as if there is plenty of energy in one form or another available to meet any future needs.

Two panels of top men in the energy field looked at the future recently. One panel spoke at Columbia University. It was sponsored by Columbia and the American Petroleum Institute. The other appeared at the annual meeting in Denver of the Rocky Mountain Oil and Gas Association.

Here's how these men see the future energy picture:

Dr. Edward Teller
University of California

THERE WILL BE no acute shortage of any fuel in the present century, but shortages will develop as more and more fossil fuels are used. For this reason, energy resources of the past must be supplemented.

Dr. Teller, one of the nation's foremost physicists, said the one reason we need to supplement our present fuel supply is because "demand is rising fantastically." He spoke at the Columbia session.

"There is another reason why we need new fuels, hypothetical at the moment, but probably very real. This is contamination of the atmosphere.

"Conventional fuel makes carbon dioxide. While much of it ends up in the oceans, where it is precipitated as calcium carbonate, some remains in the atmosphere. Its percentage of the atmosphere is growing and by the end of this century could conceivably reach 16%.

"Carbon dioxide in the atmosphere impedes radiation of heat from the earth. When its content reaches the level expected in the year 2000, this impediment could be serious by causing a temperature rise. A sufficient temperature rise would melt the ice caps at the poles and inundate the low-lying areas of the world which encompass many of the major cities," the noted scientist added.

Dr. Teller said nuclear energy is the most promising of the new fuels—and cost is not the principal barrier holding back nuclear energy. He said although separation is expensive, nuclear power can be produced on a B.t.u. or dollar basis of ⅔ to 70% of what you pay for conventional fuels.

Gasoline will be needed for centuries to fuel cars and planes, Dr. Teller said. For this reason, the first objective of nuclear power is stationary reactors which would save oil for transportation fuel and petrochemicals.

Dr. Teller said the peaceful use of atomic explosions should be permitted.

"They could help greatly in geographical engineering, the making of canals, harbors, and other major earth-moving operations. They could help in oil production by the blowing away of several hundred feet of overburden from oil bearing shales. They could be used in oil-bearing formations to make them more porous.

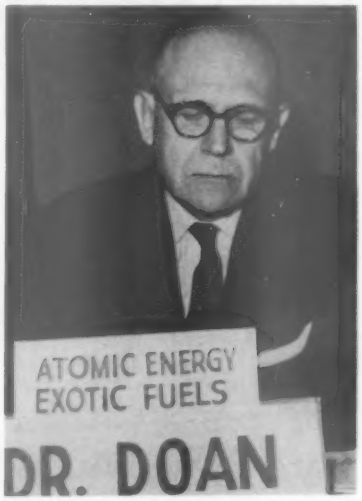
"Permission to continue nuclear explosions could contribute greatly to the realization of the promises of nuclear energy. And they should be continued for they can be made completely clean with no danger of fallout."

Dr. R. L. Doan
Manager, Atomic Energy Department
Phillips Petroleum Co.

RESIDUAL FUEL oil is the only petroleum product which will be pinched by the growth of atomic energy.

Dr. Doan, speaking at the RMOGA meeting said the only serious competition between uranium and petroleum will be in the field of power plants and marine propulsion now supplied by residual.

Dr. Doan also predicted the present



oversupply of both oil and uranium will not continue "very far into the future" due to the world-wide increase in population and industrialization.

Atomic energy will play a small part in the energy picture until the end of 1966 since the Atomic Energy Commission has first call on much of the uranium produced until then. But uranium is expected to take a

Other Energy

steadily increasing part of the energy market—particularly if some scientific breakthroughs are made.

Breeding rather than separating atomic fuels would give the world an almost unlimited supply of fuel. Breeding is merely where an active isotope activates an inactive isotope. Or putting it another way: Through breeding a nuclear reactor could produce more fissionable material than it consumes.

Breeding has been accomplished on a small scale at the National Reactor Testing Station and will be checked out thoroughly on a commercial basis in a reactor which will be built by Detroit Edison Co. and others at Lagoona Beach on Lake Erie.

Dr. Doan said current uranium reserves of 185,000 tons is enough to "put nuclear fuels in the big league with coal and oil" if all the uranium could be burned.

"In present nuclear power reactors, only about 1% of the uranium is burned. On this basis the present domestic uranium reserves are the energy equivalent of 5.7 billion tons of coal or 23 billion barrels of oil.

"With advances in nuclear reactor technology—particularly in the area of fast breeder reactors which are capable of producing more fissionable material than is consumed—the percentage of uranium that can be burned in nuclear power reactors will almost certainly increase over the present 1%."

Dr. Doan pointed out breeding is a "built-in escalation factor not possessed by coal or oil."

"On the basis of a 10% utilization, which should be attained in the not-too-distant future, our present domestic uranium reserves would be the energy equivalent of 57 billion tons of coal or 230 million barrels of oil."

Exotic fuels . . . Exotic fuels "attract the attention, but do not encourage further advances," according to Dr. Doan.

Research to date has shown the exotic or high-energy fuels have limited use. This could all change, Dr. Doan said, due to the vast research program the Government is making into high-energy fuels. But so far, the fuels have not been developed into a practical high-performance aircraft or rocket fuel.

The main interest in exotic fuels is their potential of offering added altitude, speed, and range to aircraft and missiles now powered by liquid or solid propellants. But many problems must be solved before the fuels are ready to take over this role.

Fred L. Hartley
Research Vice President
Union Oil Co.

A COMMERCIAL shale-oil industry is technically possible, but is being blocked by a useless depletion allowable.

Currently, the shale-oil industry receives 15% depletion on shale ore, which has no value until the oil is extracted. What the industry needs to make it commercial is a 27½% allowance based on raw shale oil, which is obtained by retorting the shale ore.

This was the impression given by Hartley when he spoke at the RMOGA meeting.

Hartley said Union's experimental shale-oil plant near Rifle, Colo., proved the shale-oil industry has far more political problems than technical problems.

The Union plant, which was closed after operating about 2 years, produced from between 600 and 800 bbl. of raw shale oil daily from a 1,200-ton retort. The output varied with the quality of the shale ore. The raw shale oil is a waxy product not suitable for pipeline movement.

However, after coking and being treated with Union's Unifining process, the shale oil produces a 40°-gravity fuel oil which can be processed into a wide range of products.

Among other things, Union has produced gasoline, diesel fuel, and jet fuel from shale oil. Hartley said Navy tests showed the jet fuel produced from shale oil is superior in some cases to today's jet fuel.

At the Rifle plant, Union used a retorting process in which the shale ore was forced up through the retort from the bottom. The ore was heated as it passed up through the retort. Liquids and gases were produced from the bottom and spent shale ash was forced out the top. A rock pump which will have a 20-year life was developed, he said.

There are vast reserves of shale ore in the world, with the biggest in Brazil and the Rocky Mountains. The richest reserves are in Australia. This Australian ore produces 100 gal. of shale oil per ton of ore. The shale ore found in 25 states in the U. S. produces about 15 gal. of oil per ton.

Hartley estimated there are 1.5 trillion barrels of shale oil in a 1,200-sq. mile area just east of Rifle in the Piceance Creek basin. This is roughly 50 times the proved crude-oil reserves in the U. S.

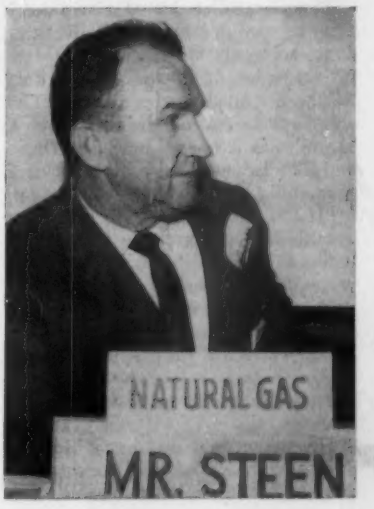
He predicted "sometime in the future" the cost of producing shale oil will cross the cost of finding crude oil. He pointed out while the cost of finding crude reserves will increase, the cost of retorting the big available reserves of shale oil will decrease.

If a commercial shale-oil industry is established, shale processing plants will be built in the Rockies near the shale ore. The low-cost fuel in the Rockies plus the problems of transporting the waxy, retorted oil would primarily be responsible for building the plants near the ore reserves.

Hugh F. Steen
Vice president and operations manager
El Paso Natural Gas Co.

THERE IS a big need to find more natural-gas reserves, both from the standpoint of meeting a rising demand and to keep the reserves-production ratio in balance.

Present gas reserves represent ap-



proximately 22 times current net production, according to Steen. This is a drop since 1945 from 30 times net production—and statistics show the industry is not finding gas to maintain a 20-year supply of reserves.

"In 1958, only 19 trillion cubic feet were added to reserves. The most conservative estimate currently being made for the demand for gas 10 years from now is approximately 17 trillion cubic feet for each year. If we only discover the same amount of new gas in 1968 as we did in 1958, we would be just barely breaking even," Steen said.

The El Paso executive, one of the speakers at the RMOGA meeting, said the price of gas must be permitted to increase "to encourage exploration to the economic limit to the point where it is cheaper to make present petroleum products from coal."

Ira H. Cram
Senior vice president
Continental Oil Co.

THE ROCKY Mountain area has two advantages which make it an attractive area for future oil exploration—the geology is the type which produces giant fields and the drilling density of the area is below most of the nation.

Cram, who worked in the Rockies several years before becoming a Continental executive, paints a bright picture for future exploration in the Rockies.

"The Rocky Mountain area is an enormous area, sparsely drilled, already containing giant fields, with favorable geology and big geology of the type that giant fields spring from —this is a set of conditions that simply has to mean that the undiscovered reserve is importantly large," Cram said.

There is still a lot of virgin territory to be drilled in the Rockies. Cram said only one dry hole for each 27 sq. miles of prospective territory has been drilled in the Rockies. This compares to one dry hole for each 2 sq. miles in Kansas, Louisiana, Texas, and Illinois, and one dry hole for each 4 sq. miles in the U. S. as a whole.

"If the Rocky Mountain area were ever drilled as densely as the U. S. is today and proved to be as productive per square mile as the U. S. is today, then the total hydrocarbons found would be the equivalent of about 53 billion barrels of crude oil. About 29 billion barrels would be crude oil, over five times the amount found thus far," he said.

He pointed out that in the nonproducing counties of the Rockies, less than 1,200 dry holes or one dry hole

to about 300 sq. miles have been drilled.

"It is a fair conclusion that a high percentage of the area in question is still relatively virgin."

Robert G. Dunlop
President
Sun Oil Co.

ABOUT 70% of the energy consumed in the U. S. comes from either crude oil or natural gas, but this figure is "grossly inexact" when you look at all the uses for petroleum.

Dunlop pointed out the 70% figures does not "encompass the explosive effect on the economy of the mobility of the gasoline engine." Nor does the figure include the significance of oil's role in lubricating the tools which produce other forms of energy.

"Petroleum is more than a source of energy," Dunlop said. "The petroleum revolution springs not just from the remarkable versatility of the hydrocarbon, but also from the dynamic nature of the industry itself.

Robert G. Dunlop

"Its nature fosters competitive forces. The migratory characteristic of petroleum places great competitive pressures on the oil man to produce. Once produced, petroleum cannot be stored easily so that the oil man is under great competitive pressures to sell . . .

"By using an engineering approach to cost-cutting, the industry has achieved great economies in distribution. Pound for pound, no commodity reaches the consumer at distribution costs as low as those oil has been able to achieve.

"These competitive pressures encourage integration. It became essential, if continuity of supply was to be maintained and economic waste avoided, that successive functions be integrated under a single management or by contract."

Herbert Hoover, Jr.
Consulting Engineer

REGULATIONS in some cases have made a "great contribution" to the growth of the petroleum industry. And it looks as if the industry faces regulations of some types for years to come.

Hoover pointed out some controls have not helped the industry, but others have been effective in ironing out political and economical problems at various times.

Antitrust legislation has been "on the plus side of the ledger," Hoover said. He said the antitrust laws have maintained competition and pointed to the fuel industries as an example of how this type of federal regulation has not prevented a low-cost product.

Hoover said the control on a state level of crude-oil production has helped stabilize the oil industry and has led to more efficient operations.

"One of the practical effects of state regulation has been to make possible an expansion of production for emergencies of between 2 and 3 millions barrels daily. It is improbable that the higher figure could be sustained for any appreciable length of time without affecting the ultimate recovery and a lower estimate would be more realistic," Hoover said.

"The Suez emergency indicated, however, that even an increase of 1 million barrels daily was not possible to attain in practice due to the lack of pipeline facilities to market . . .

"In the Suez incident, it is doubtful if the shortages to Europe could have been met had it not been for an unanticipated increase of production from South America."

In regard to international oil, Hoover said the abundance of oil in

Herbert Hoover, Jr.

so many foreign fields may have a "sobering" effect on those governments which want bigger royalties for their oil.

He dismissed nationalization of the oil industry in some foreign countries by pointing out less than 2% of the free world's reserves are in the countries toying with the idea of a nationalized industry. And in these countries, the move toward nationalization is inspired more by politics than economics.

Import controls will continue for a long time.

"It is too early to determine whether the present method of control will prove to be the most desirable one or if some alternative may be more suitable. Regardless, it seems certain that some form of control will continue for the foreseeable future."

Edward S. Mason
Professor of Economics
Harvard University

U. S. OIL and gas producers are not interested in low-cost energy.

Mason made that charge at the Columbia meeting, stating, "It is absolutely clear that there are many groups, possessing great economic and political weight, who are not interested in a low-cost energy supply."

The Harvard professor said gas producers complain bitterly that they are already selling at too low a price and they claim that their increasing share of the U. S. energy market is due to governmental control of field prices.

In claiming oil producers are not interested in low-cost energy, Mason said, "On the contrary, they tend to assert that, unless the price of oil is increased, the increasing cost of domestic oil exploration and development will soon cease to be covered.

Edward S. Mason

"International oil companies, it is true, are interested in drawing a larger part of their oil, for sale in the U. S., from lower-cost foreign sources. But, so far as I know, they have not expressed a desire to pass these cost advantages along to the consumer."

Mason added that neither Venezuela nor the Middle East has a "very great enthusiasm" for low-cost energy, concluding that "the forces arrayed against the objective of low-cost energy are strong."

Variety of Land Offered in Texas Lease Sale

THE STATE OF TEXAS will offer oil and gas leases December 1 on a 205,000-acre hodgepodge of public school, prison, hospital, and Indian lands.

The school lands, making up the bulk of the offering with about 197,000 acres, include offshore, coastal, river-bed, and upland tracts.

Among the bay and bayou leases offered are two on which oil production has long been established. Both now are actively producing under 25-year leases which expire in January 1960. They are believed to be the first submerged lands leases to expire and revert to the state. One, a 77-acre tract, is located in Turtle Bay in Chambers County. The other takes in 147 acres in Dickinson Bayou in Galveston County.

New leases on the two tracts will take effect on expiration of the present leases in January. The School Land Board will retain a one-fourth royalty and award the leases to the bidder of the highest cash bonus. Minimum bonus accepted will be $15 an acre. Rentals will run $5 an acre.

Submerged lands . . . The school lands on the block in the December sale will include roughly 163,000 acres of submerged lands in coastal bays and bayous.

They are located off Aransas, Galveston, Jackson, Nueces, Refugio, Calhoun, Chambers, Cameron, Willacy, Kenedy, Kleberg, Matagorda, Jefferson, and Harris counties.

The board will offer 16,000 acres of offshore leases in the Brazos area of Matagorda County and the South Padre Island area of Cameron County. All of these tracts are within 3 miles of the coast. No lands will be offered in the region now in dispute between state and federal governments.

River beds . . . The state is asking a one-sixth royalty, $15 per acre minimum bonus, and $5 per acre annual rental on 30 river-bed tracts—all in the vicinity of oil or gas production.

On another 10 such tracts, it is asking operators for a fixed bonus of $50 an acre and annual rental of $5 an acre, but with the lease to be awarded to the bidder willing to give the biggest royalty. No bid of less than one-sixth royalty will be considered.

Total acreage involved in both categories is about 4,150.

Upland acreage . . . The School Land Board will accept bids also on roughly 13,300 upland acres in 24 counties—mostly in West Texas.

Tracts are a section or less in size.

Operators also may lease:

. . . 4,200 acres of prison lands on the Barrington and Ramsey prison farms in Brazoria County. Terms include one-sixth royalty, $15 per acre minimum bonus, and $10 rental.

. . . 3,000 acres of Indian lands in Alabama and Coushatti Indian Reservation in Polk County. Royalty terms include one-sixteenth to the tribe plus five-forty-eighths to the state. Minimum bonus is $15 and $5 rental.

. . . 800 acres of hospital lands. These include two tracts owned by the Rusk State Hospital in Cherokee County. Terms include one-sixth royalty, $15 minimum bonus per acre, and $5 rental.

Tanker catastrophe

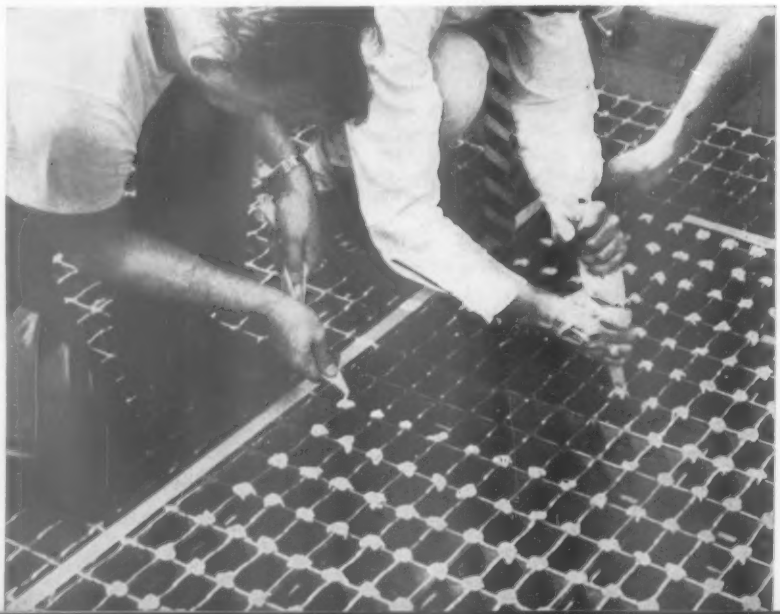
AMERICAN Oil Co.'s Amoco Virginia, a 170,000-bbl. oil tanker, went up in flames November 8 while taking gasoline at the Hess terminal in the Houston ship channel. Seven crewmen died, and a fireman was killed while battling the blaze. Cause of the fire was being probed by both the Coast Guard and a five-member investigating group from Harris County, Texas. The fire was checked before it spread to the tank farm adjoining the docks.

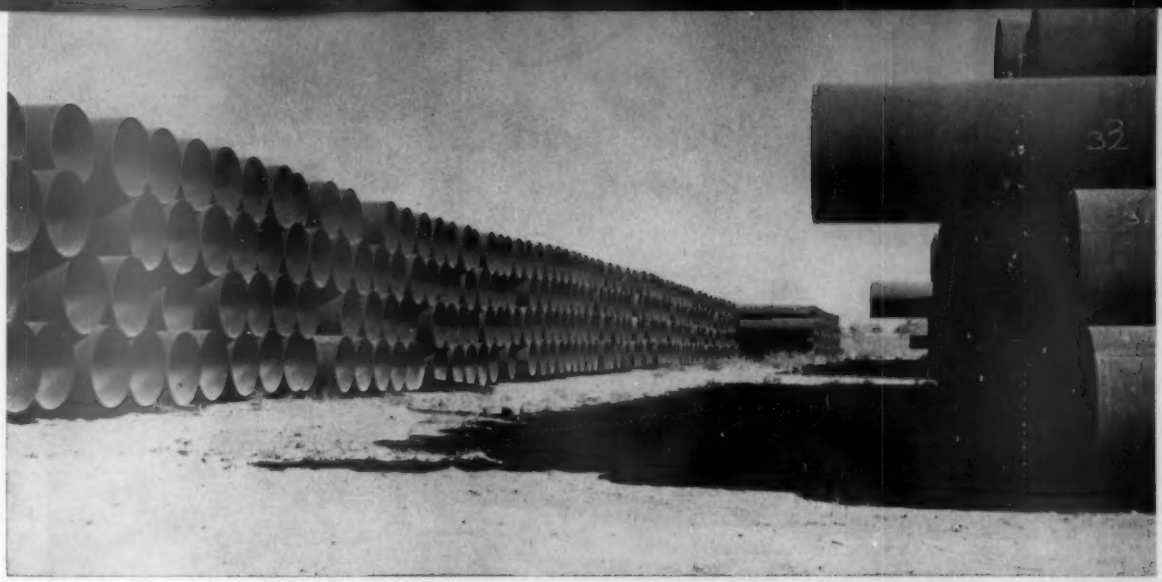
Skid-proof cookies

COOKIE-LIKE blobs of plastic and grit eliminated skidding accidents on the steel grid of a bridge in California.

The cookies are a mixture of EPON resin, developed by Shell Chemical Corp., and emery. It is shown being applied, sort of cookie-style, to the cross points of the grid. The EPON bonds to the steel, and the emery provides extra traction for cars.

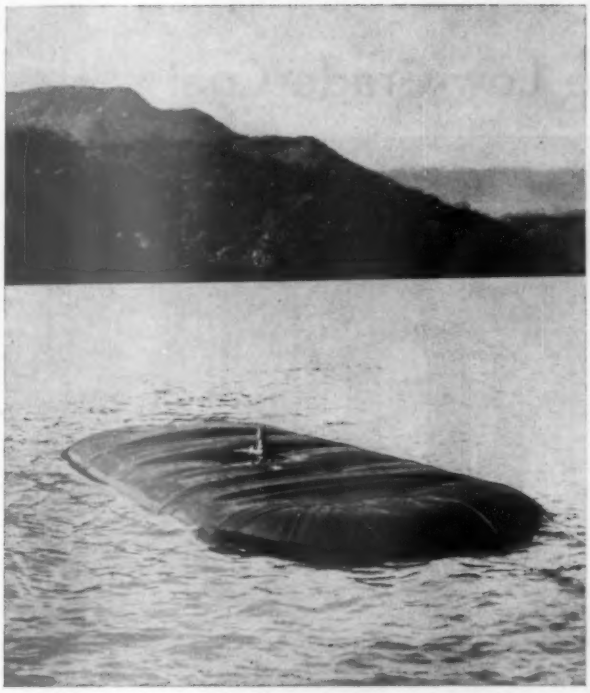
As many as 35 skidding accidents had occurred in 1 year on the steel grid of the Park and Hyde Street bridge between Oakland and Alameda, Calif. There have been no such auto mishaps since the EPON cookies were applied late in 1957.





Full speed ahead

NO TIME was lost in starting construction after Transwestern Pipeline Co. finally got the green light on its $191-million gas system from West Texas to the Arizona-California border. Pipe had been ordered and delivered by June as a hedge against a steel strike. One stockpile of pipe is shown near Roswell, N. M., along the Santa Fe Railroad.



Whale of a way to move oil

HAULING 1,000 gal. of diesel fuel down a remote tributary of the Amazon in the Bolivian jungle is this rubber-coated nylon tank—dubbed the "Whale."

Made by Firestone Tire & Rubber Co., the tanks originally were designed for storage liquids. But South American Placers, Inc., is using the tanks to carry fuel to an isolated gold-dredging operation deep in the jungle.

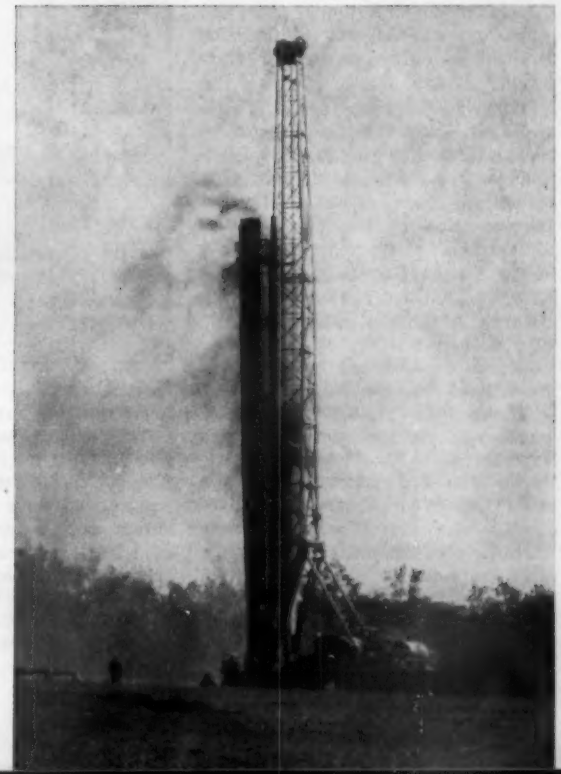
The diesel fuel is lighter than water and the tank floats. It is accompanied downstream by two natives on a balsa raft.

Wild well tamed

A WILD well in Michigan raged for 5½ days following a blow out before it was brought under control by Red Adair, Houston fire fighter.

The oil well, the Perry Fulk 1 Mann, SE SE NW 23-5s-3w, Hillsdale County, flowed an estimated 150,000 bbl. of fluid—about 65% of that crude oil—before it was killed.

Turtle Drilling Co. had set 5½-in. casing to 3,973 ft. and had cemented shortly before the flowout. The 132-hour battle to kill the well set a Michigan record.



HALF-WAY mark is reached in construction of Britain's high-pressure gasification plant.

Gas-Making Plant to Use Low-Grade Coal

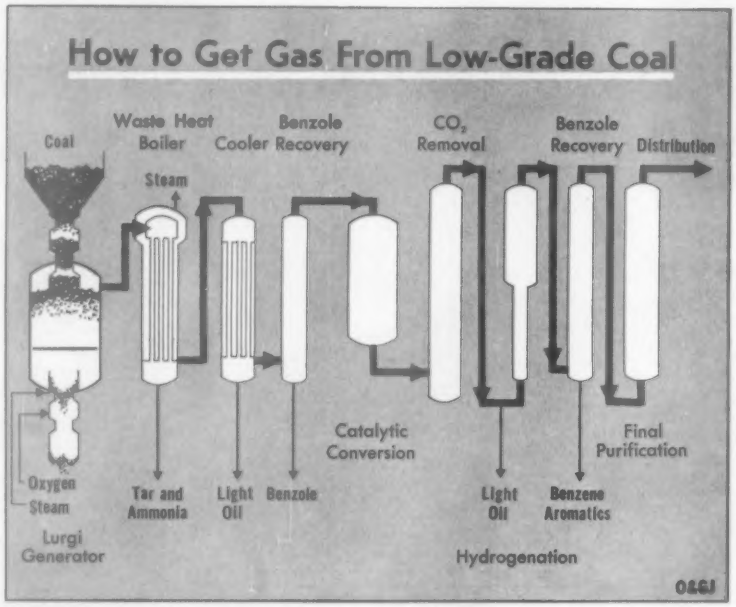
THE GREY-BEARDED business of coal gas manufacturing is clinging tenaciously to life in one of the countries where it has been practiced the longest.

A new high-pressure gasification plant being built in Scotland will be the first in Great Britain to use low-grade coal. The project comes at a time when local supplies of standard gas-making coal are running short and when overseas exports of liquefied methane is only a matter of years away.

While the Scottish program is relatively small, it may indicate that technical advances in gasification will enable local industries to at least keep a share of growing markets that would otherwise go to natural gas from abroad.

The Scottish Gas Board is spending $18.2 million on facilities that will produce 30 million cubic feet daily of purified gas from low-quality coal obtained from a nearby open pit mine.

The Scottish project is half completed, and the first of two stages is expected to be in operation by early 1961. The contractors, Humphreys and Glasgow, Ltd., London, are building the works at Westfield, County Fife. Core of the plant is a German-built Lurgi gasifier, developed by Dr. O. Hubman and Dr. F. Danulet for Lurgi Gesellschaft fur Warmetechnick M.B.F., Frankfort-on-Main.



How it works . . . Three Lurgi gasifiers are being installed.

They are cylindrical pressure vessels 9 ft. 10 in. in diameter and 28 ft. high. Gasification is carried out by a continuous reaction of coal, steam, and oxygen at a temperature of 1,200° F. under 370 psi.

A special sealing arrangement permits the addition of coal and the removal of ash without a loss of pressure through leakage. Each unit uses 220 tons of steam and 60 tons of oxygen daily to produce 7.5 million cubic feet of gas. A water jacket surrounds the gasifiers. These keep the walls cool, and also serve as a generator of steam.

Gas moving from the Lurgi unit is cooled in stages to permit the withdrawal of tar, ammonia, and other products. The gas stream is then treated in high-pressure Benfield type purifiers for carbon dioxide removal

and hydrogenation. Potassium carbonate is used as the separating chemical. This is revivified by boiling.

Final traces of hydrogen sulphide will be removed in a Bishoff plant especially designed for high-pressure operation, and which has had a large number of valves eliminated.

The purified gas will have a caloric value of 410 Btu. per cu. ft. This will be enriched with butane to 450 Btu. before it is added to the distribution grid.

Concession Granted

. . . to Texas American on big block in Australia.

THE RUSH to grab acreage in Australia continues to build up steam.

Texas American Oil Corp., Midland, Tex., has been awarded a concession on a solid block of more than 3,200,000 acres in northern New South Wales.

The concession has been confirmed by the New South Wales Government. Formal approval came from C. St. J. Mulholland, undersecretary of the provincial Department of Mines at Sydney.

The acreage is in the southern end of the Great Artesian basin. It adjoins the so-called "Lucky Strike" block of about 41,000,000 acres held by Phillips Petroleum Co. and Sunray Mid-Continent Oil Co., also the huge block to the north held by Delhi-Taylor Oil Corp. and Santos, Ltd.

Nash Dowdle, president of Texas American, said his company would form a new Australian subsidiary to explore and develop the New South Wales grant. He said his firm had filed other applications for concessions in Australia. Any added acreage would also be handled by the new subsidiary. The company has filed applications covering several million more acres in Australia.

Israel Field Is Commercial

A SMALL new gas field in Israel apparently has sufficient reserves to sustain limited commercial production.

The government in a joint statement with the operating company, Naptha-Israel Petroleum, said four wells drilled so far in Zohar field can be expected to yield the equivalent of 1,900 bbl. of oil daily for 15 years. The latest completion is the best, with a gas flow equal to 1,400 bbl. of oil daily.

Zohar is located in hill country west of the Dead Sea. Plans for a 20-mile pipeline to potash works at Sodom are under study. The gas is produced from lower Cretaceous.

No Bottlenecks in Suez Canal

. . . since it was taken over by UAR 3 years ago. A record number of tankers are now moving through the canal.

THE UNITED ARAB Republic appears to be making good on its promise to keep the world's busiest oil artery free from clogging.

Today—3 years after nationalization and subsequent blocking — the Suez Canal is moving more tankers than ever before, is moving them efficiently, and is undergoing an impressive expansion program.

The waterway has become a show piece for the Egyptian Government, which has been trying hard to live down the anxiety generated when the canal was taken away from the old, French-controlled Suez Canal Co. Widespread opinion at the time was that inexperienced pilots would soon cause serious delays and accidents on the Egyptianized canal.

Operation smooth . . . Nearly 50,000 vessels have moved through the waterway since nationalization without any serious trouble. A record number of about 52 ships daily now passes through the canal in three convoys, two southbound and one moving north.

More than two-thirds of the tonnage is accounted for by tankers. Shipments of crude and products from the Persian Gulf to European, U. S., and Canadian markets are close to 2 million barrels daily.

The canal is also an important artery for Russian and Romanian oil shipped to the Far East from Black Sea ports. These shipments average close to 50,000 bbl. daily. The average cargo per tanker, in both directions, has risen to 171,000 bbl., compared with 154,000 bbl. a year ago.

Improvement program . . . The government is collecting tolls grossing $110 million per year. Last year this income covered operating costs and improvements and left a $15-million profit for the Egyptian treasury.

Under the leadership of Mahmoud Younis, Egypt's Suez Canal Authority is spending $29 million on a short-term project deepening the channel from 35 to 37 ft. This will enable the canal to handle all except a few exceptionally large tankers. The most important side of the program is a $20-million contract for American dredgers.

The short-term program will be completed next year. This will be followed by a 10-year program known locally as the "Nasser project". When it is finished, the canal will be able to take even larger tankers and will be able to handle two-way traffic. Egypt is seeking a $40-million loan for the project from the International Bank for Reconstruction.

Russia May Pass Venezuela

RUSSIA may replace Venezuela as the world's second-ranking crude producing country next year.

The Soviet time table for 1960 calls for an all-time high output of 144 million metric tons, or about 2,880,000 bbl. daily.

Operators in Venezuela have capacity considerably higher than this level, and have in one individual month produced nearly 3,100,000 bbl. daily. But in the face of government determination to limit output, a profit squeeze caused by a revised income tax law, and generally tough competitive conditions, chances are poor that Venezuelan output will match the Russian level.

Russia's 1960 goal represents a 11.6% gain over this year's output, which is expected to reach 129 million tons, or about 2,580,000 bbl. daily. This compared with 113 million tons, or 2,260,000 bbl. daily, last year.

A. N. Kosygin, chairman of the USSR state planning committee, indicated that oil exports also will be at an all-time high. He did not give firm figures, but said the prospect has improved for allocating a considerable quantity of fuel for export.

New refinery capacity will permit a 9.3% increase in light-oil production, including a 15% gain in diesel oil.

Oil and gas will continue to capture a growing share of Russia's domestic energy market, despite sharply rising crude and products exports. The oil and gas share of the total fuel market is expected to rise to 38.7% next year, compared with 35.3% in 1959. The gain will be made largely at the expense of coal.

Pemex Gas Line Moves Ahead

CONTRACT has been awarded for eight river crossings for Mexico's longest pipeline—the 491-mile 24-in. natural-gas line being built from Pemex City to Mexico City.

Mexican contractors are working at both ends of the project, which is being built for Petroleos Mexicanos and financed by a $40-million loan from four U. S. banks (OGJ, April 27, p. 103).

The line, to have a capacity of 500,000,000 cu. ft. daily, is part of an expansion program undertaken after Pascual Gutierrez Roldan became director of Pemex in December 1958. It will connect Pemex City's new absorption plant to industrial centers near Mexico City. Feeder lines from the mainline will also serve industrial centers along the way.

Contract for eight river crossings from Pemex City west to the foothills of the Sierra Madre del Sur was awarded Collins Construction Co., Port Lavaca, Tex., and Constructora Inde, S.A., Mexico City.

The crossings will be the Grijalva, Samaria, Tonala, Coatzacoalcos, San Juan, Tesechoacan, Obispo, and Papaloapan rivers.

Program results . . . The long-range Pemex program to improve transportation facilities in Mexico is showing results.

Imports of foreign products the first 7 months were down to 22,600 bbl. daily, compared with 35,400 bbl. daily last year. The total cost of the imports were $24.4 million, down from $36.3 million for the preceding period.

Exports were up to 71,300 bbl. daily, from 55,000 bbl. daily. But these are made up largely of heavier ends, and there was comparatively little increase in sales revenue. This rose to $19.7 million from slightly less than $19 million.

Argentine Picture Brighter as Imports Dip

ARGENTINA MAY be over the hump in its struggle to solve its oil problems.

The country still has a long and difficult way to go before it becomes self sufficient for oil. But the situation took a turn for the better during the first 9 months of the year when the country's bill for imports took a downward dip from the same period last year.

YPF says the saving amounted to $34.3 million. It attributed this to higher local production.

The drawing of foreign exchange to pay for oil imports has been one of the country's basic troubles. President Arturo Frondizi, in an effort to solve the problem, has staked his government on a policy of building the local industry through development contracts with foreign companies.

Domestic crude output in the January-September period averaged 120,000 bbl. daily, up 24,700 bbl. daily from the first 9 months last year. Imports in the same period averaged 151,000 bbl. daily, down 25,400 bbl. daily.

Production developed under development contracts amounted to only a few thousand barrels daily. But this level will increase steadily as drilling continues and transportation facilities are built.

Indiana Standard will increase production substantially on acreage it is developing when an 84-mile 12 and 14-in. pipeline to the coast is completed next year. The company's local subsidiary has drilled 56 wells so far, of which 46 are producers.

Lack of transportation has limited output to 5,000 bbl. daily.

Expensive Libyan Test Is Producer

A $3-MILLION wildcat drilled by Shell Libya has been completed as a 700-bbl.-daily producer.

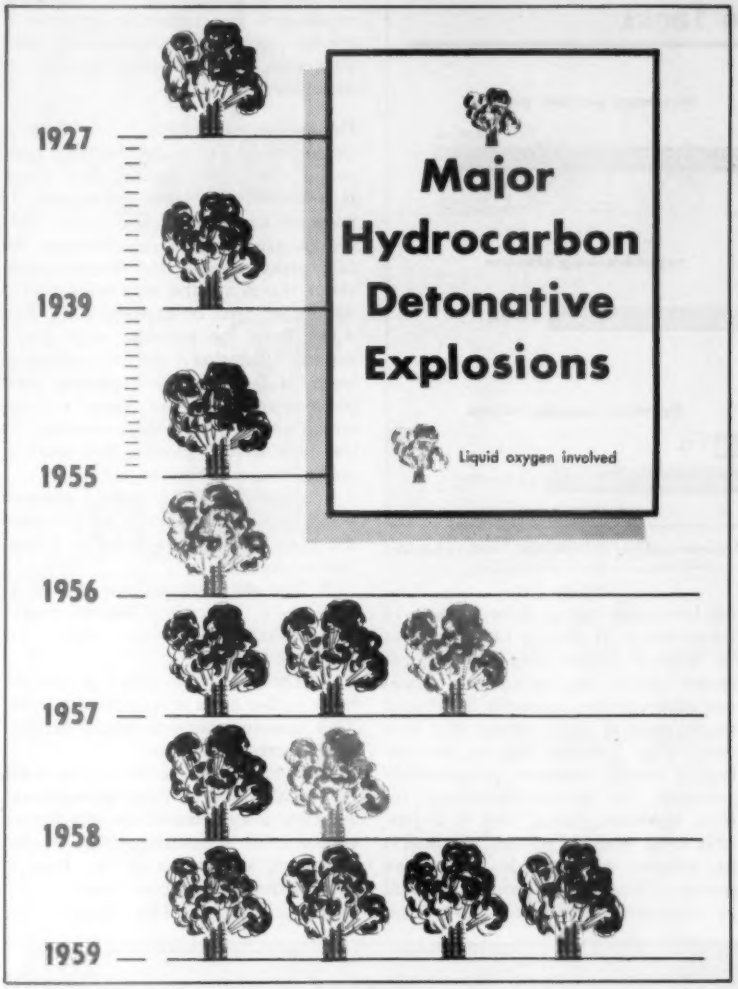
The company's Bir Tlacsin A1 on Concession 70 flowed 700 bbl. daily of 44°-gravity crude on test from a zone between 8,882-8,976 ft. The location is about 120 miles southwest of Tripoli.

The well was spudded the last day of last year, and the pay zone was encountered in March. But the test was deepened to 13,187 ft. before plugging back. Much of the drilling was through extremely hard formations, and diamond bits were required.

A stepout is being started about 4 miles from the discovery.

Another company, Libyan American, has completed its second producer on Concession 17 which lies west of Oasis Oil's Block 32. Zahaligh B1 was completed at 3,263-3,386 ft. and pumped at the rate of 800 bbl. daily.

Zahaligh is a 10-mile extension of the initial find, Mabruk A1. The rig has been moved to C-1 where the third test will start immediately.



THESE MAJOR EXPLOSIONS of the detonative type have caused a minimum damage of 1 million dollars or a multiple loss of human lives. Fig. 1.

Detonative explosions

need more close industry study

Not too much is known about conditions under which detonations occur, but it is believed that almost all flammable gaseous hydrocarbon-air mixtures can detonate, and also that flammable hydrocarbon mists in air will detonate.

BY R. B. JACOBS
Manager, Engineering Research
Standard Oil Co. (Indiana)

MAJOR DISASTERS due to hydrocarbon detonations have been more frequent in recent years. An examination of the conditions leading to detonative explosions indicates that large modern installations with long pipe runs, large vessels, and high-velocity vapor lines are more susceptible to these explosions. However, old process units and small equipment are also susceptible.

Disasters can be avoided only by carefully guarding against all conditions which can result in the presence of flammable mixtures within operating units. If air or oxygen must be used in the refining process, its concentration in hydrocarbon mixtures must be known at all times and must be rigorously controlled.

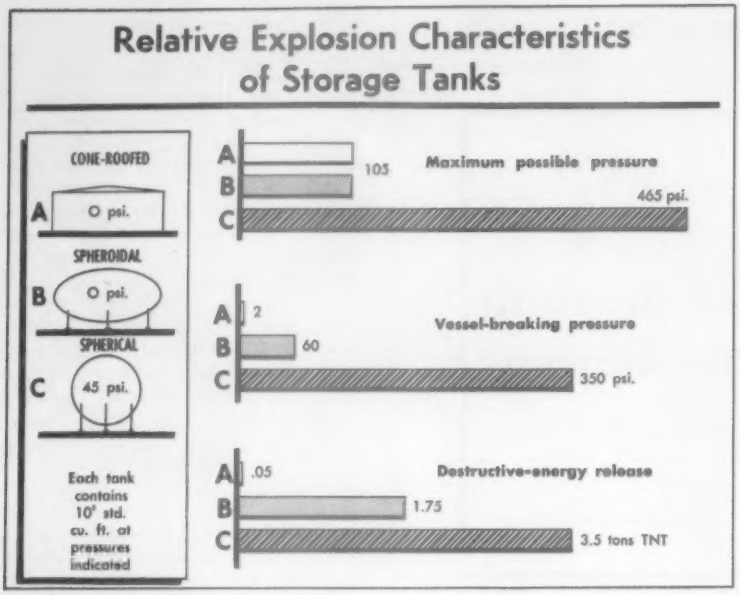
What they are . . . Detonative explosions are a particularly violent type of explosion which takes place under certain conditions which we can only roughly define.

In Fig. 1 we have plotted all major hydrocarbon explosions with which we are familiar and which we believe to have been of the detonative type. By "major" in the present connection we imply a minimum of about $1,000,000 financial loss or multiple loss of human lives. We have also plotted separately those disasters where hydrocarbon detonations involving liquid oxygen were involved. Regardless of whether these latter are counted in, it appears that major disasters due to hydrocarbon detonations have become more frequent.

Part of this may be only apparent and possibly due to a greater knowledge and awareness of detonative phenomena in recent years. However, this is by no means the whole story, and the conclusion appears inescapable that highly destructive detonations have been more frequent recently than in the past. Therefore, we believe it is most important that those concerned with the design and operation of plants handling hydrocarbons be fully aware of what detonations are and under what conditions they can occur.

Normal explosions . . . When Explosions take place "normally" (i.e., without detonation) it is possible to calculate approximate values for (1) the maximum pressure which can be generated and (2) the destructive-energy release. These quantities are plotted in Fig. 2 for three different cases: a cone-roof tank, a spheroid, and sphere, each containing the same quantity of a given flammable mixture. The values given here are maximum theoretical; in the average case they would be about one-half as large as those indicated.

Notice particularly that where the containing vessel is weak, as is the cone-roof tank, the vessel fails long before the maximum possible pressure is reached. In this case the explosive process is quite inefficient in its production of destructive energy. Cone



RELATIVE EXPLOSION CHARACTERISTICS of cone-roofed, spheroidal, and spherical tanks. Fig. 2.

roofs are designed with a weak angle attachment detail (Fig. 3) so that the roof will lift readily when an internal explosion takes place so as to protect the side walls. The historical record for such tanks is good in the sense that in all cases, with one possible exception, of internal explosion known to us they have failed at a low pressure by lifting their roofs and as a consequence sidewall and external damage has been relatively minor.

Apparently the size and the geometry of present-day oil-storage tanks has been such that no detonations have taken place. If storage tanks were to be built in larger sizes, it is by no means certain that detonations would not occur or that an easily lifted roof would serve to limit damage as it now does. Fig. 2 shows that as the containing vessel becomes progressively stronger, the destructive-energy release becomes greater, and it is possible even with a "normal" explosion to release considerable destructive energy. "Normal" explosions as well as detonative explosions have been responsible for major disasters. It is not our purpose to assign the role of destruction exclusively to detonative explosions, but rather to promote a greater general understanding and awareness of the phenomenon of detonation.

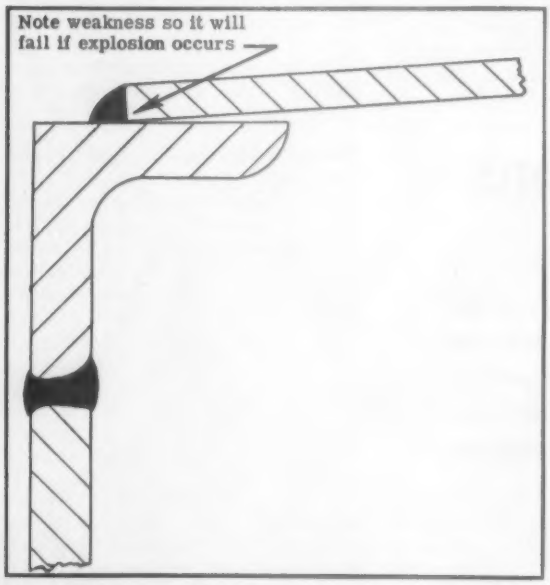
Detonative explosions . . . When a detonation takes place, burning proceeds with such rapidity that there is practically no time for mixing or pressure equalization and hence conditions are far from equilibrium. In fact, pressure piling and discontinuous shock waves are the very essence of a detonative type of explosion. In Fig. 4 we show the terminal stage for a normal explosion, and the terminal stage of a detonative explosion each proceeding from the same starting conditions. Three characteristics of the detonative explosion that make it particularly destructive are:

1. It produces a peak pressure which may be as much as 20 times the peak pressure produced by a normal explosion.

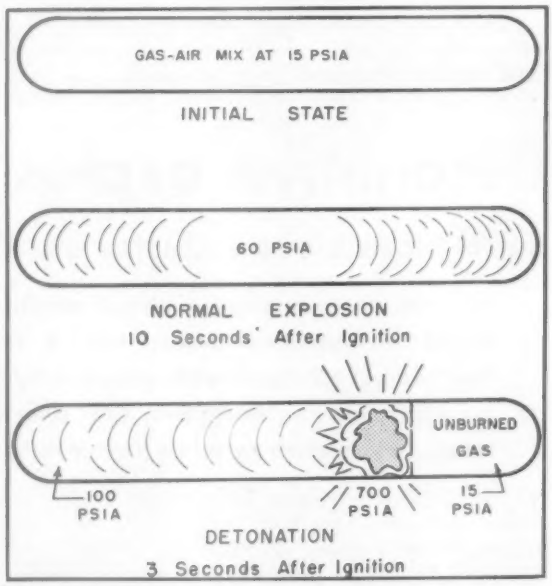
2. The detonation front travels at supersonic velocities, which makes pressure-relieving devices useless for the most part.

3. The detonation exerts a directed blow rather than a hydrostatic force. This directed blow is often particularly damaging.

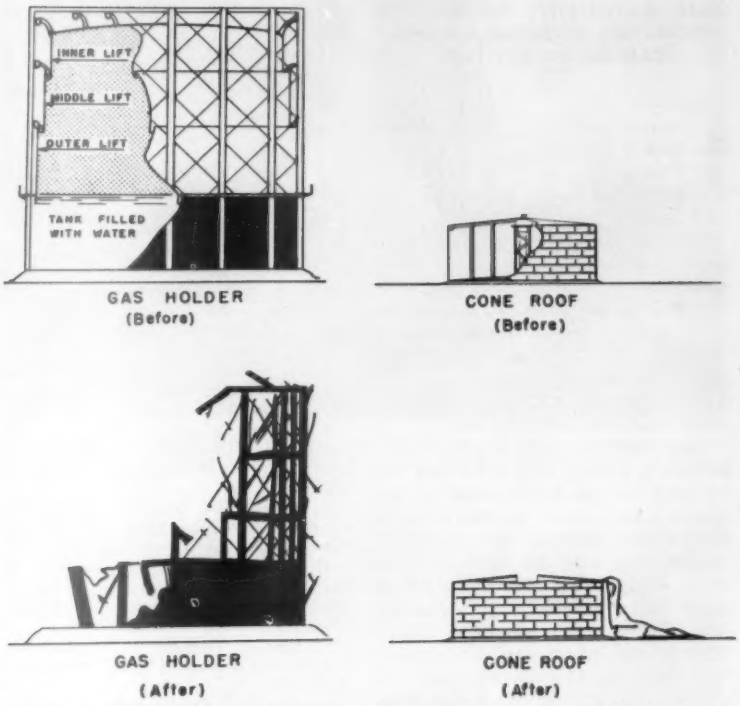
If a detonation develops, the walls of a weak vessel may not have time to fracture and get out of the way before they are hit a devasting blow by the oncoming detonation wave. Fig. 5, drawn from two actual cases, illustrates this point. The storage tank



CONE ROOFS are designed with a weak angle attachment so that the roof will lift readily when explosion occurs. Fig. 3.



TERMINAL STAGES for normal and detonative explosions show differences in peak pressures. Fig. 4.



WALLS OF WEAK VESSEL such as gas holder may be demolished by detonation wave. Storage tank explodes without detonation. Fig. 5.

exploded without detonating, lifting off the roof, and a large percentage of the explosive energy was exhausted harmlessly into the air.

In the case of the gas holder (perhaps an equally weak vessel also designed to operate only at a very low pressure) the evidence indicates that the peak pressure of the explosion was many times the breaking strength of the vessel, a situation which we believe could not occur without the presence of a pressure shock which is characteristic of a detonative type of explosion.

We have already indicated that pressures may differ widely at different locations in an enclosure subjected to an internal detonation. This is dramatically illustrated in Fig. 6, where the pressure only 25 ft. away from an open-ended pipe was sufficient to rupture the pipe (i.e., about 6,000 psi). This emphasizes the futility of relief valves or other pressure-relieving devices against detonative explosions.

In normal explosions measured peak pressures range from 3-10 times starting pressures. (See Table 1). In detonative explosions peak pressures more than 100 times starting pressures have been measured, although something more like 20 times would be more normal. However, to evaluate the real destructiveness of detonative explosions one must keep in mind these facts:

1. The impact blow which they deliver is usually more destructive than a gradually applied force of the same magnitude.

2. Detonations are reflected upon impact with solid surfaces. Such reflections momentarily multiply the pressure in the detonation front by a value of 2 or more depending upon the angle of impact.

TABLE 1—NORMAL VS. DETONATIVE EXPLOSIONS

	Pressure multiplication	Destructive energy
Normal explosions	3- 10 times	insignificant—20% (max.)
Detonative explosions	20-700 times	never insignificant

DETONATION BURSTS this pipe by high local pressure although it was open just 25 ft. away. Fig. 6.

Detonation conditions . . . Having established the very undesirable characteristics of detonations, it is natural to ask under what conditions they are likely to occur. We are unable at the present time to give an exact answer to this question. There are two reasons for this. The first is that detonations are a non-equilibrium phenomenon and are somewhat ephemeral in nature. Even under laboratory conditions it is sometimes difficult to get repeatable results.

The second reason is that not enough is known about this phenomena, either experimentally or theoretically, to establish with any degree of certainty the conditions under which an explosion will pro-

ceed normally or develop into a detonation.

Until rather recently it was generally thought that gaseous detonations were largely confined to rapid burning mixtures which would include the following:

1. Hydrogen with oxygen or air.
2. Unsaturated hydrocarbons with oxygen or air.
3. Saturated hydrocarbons with oxygen.

In addition, it was known that saturated hydrocarbons and air would detonate if these were in a highly turbulent condition. This knowledge resulted from some experimental work following up on a number of unusually violent pipeline explosions.

Now we believe that almost all flammable gaseous hydrocarbon-air mixtures can detonate. We know further that flammable hydrocarbon mists in air will also detonate. although only 2 or 3 years ago lively debates were held on the subject of whether hydrocarbon mists in air were capable of anything more destructive than slow burning.

We do not know precisely under what conditions any mixture will detonate. With considerable trepidation then, we suggest the tentative geometric criteria shown in Table 2. It is hoped that further investigations in this area will result in criteria which are much more reliable and exact. It is emphasized that the criteria given apply only to saturated hydrocarbon types beginning at atmospheric conditions in a nonturbulent state.

TABLE 2—TENTATIVE CRITERIA FOR DETONATION OF GASEOUS HYDROCARBON*-AIR MIXTURES

Diameter of vessel	Minimum length* *
Less than 1 ft.	10 ft.
1-3 ft.	40 ft.
Greater than 3 ft.	25 ft.

*For saturated hydrocarbon types starting at atmospheric, nonturbulent conditions. * *Length inversely proportional to (pressure)$^{2/3}$; length directly proportional to (temperature)$^{2/3}$.

Apparently if a high degree of turbulence is present, only a few feet are required for the development of intensive shock waves. Furthermore, if unsaturated hydrocarbons or hydrogen are involved, or if the air is enriched with oxygen, detonations proceed much more readily than indicated. Also, higher pressures and lower temperatures promote detonations. Conversely, a depletion of oxygen or a higher temperature or a lower pressure make detonations more unlikely.

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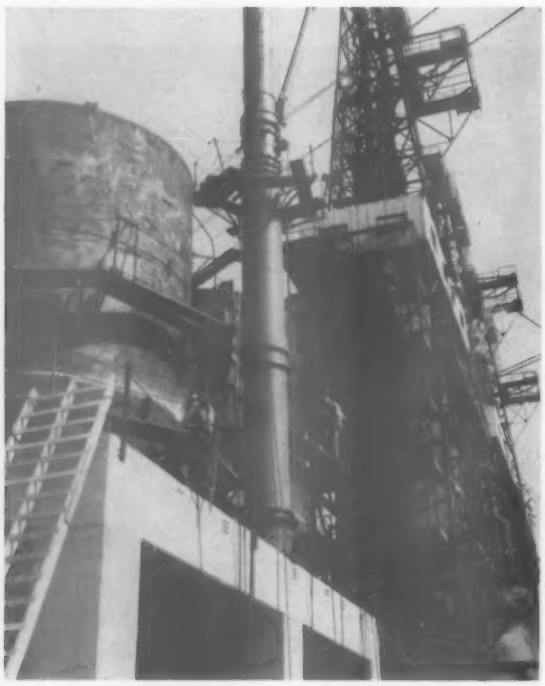
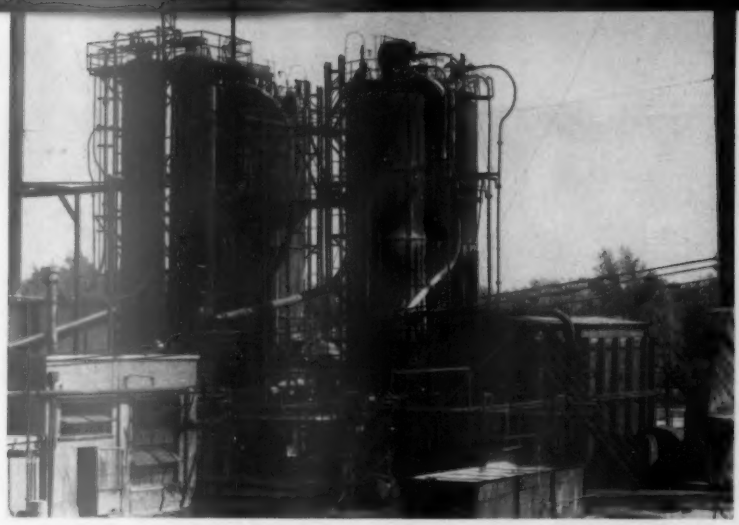
Coke drums go up at expanding coast refinery



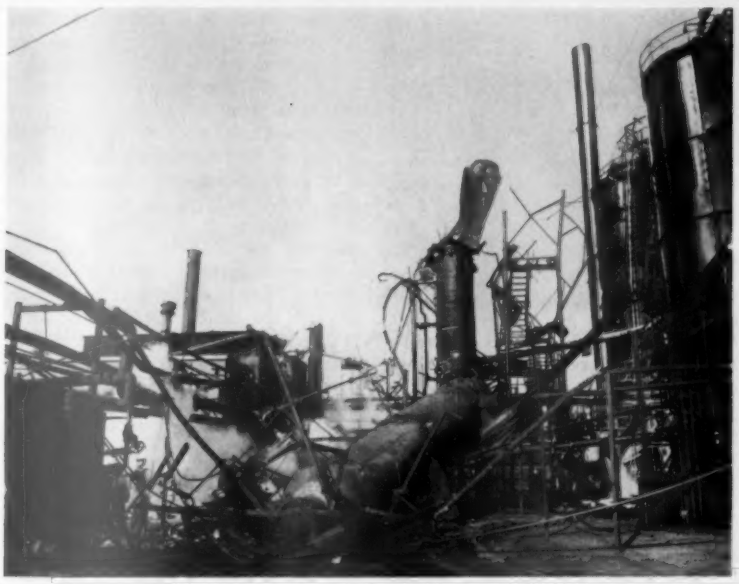
WELDERS put together pair of 17-ft.-diameter coking drums, part of new facilities under construction at General Petroleum Corp.'s refinery at Torrance, Calif.

When completed early next year, these new coking units, with capacity of 9,300 bbl. daily, will boost the refinery's coking capacity to 35,000 bbl. daily.

Beefing up of coking facilities by General Petroleum is another step in a concerted move by West Coast refiners to solve the serious oversupply of fuel oil in District 5.



BEFORE **BROUGHT ON STREAM** some 6,000 times, these two Dubbs cokers stood close together at the Cities Service refinery at Ponca City, Okla.



AFTER **A COMBINATION** of comparatively minor mistakes culminated in an explosion which rocked the nearby city and brought death to one man.

What that Cities Service explosion proved . . .

A process can be immune from detonation—but

first it must be inoculated with a startup procedure which eliminates oil-air contact

BY O. A. PIPKIN
Cities Service Oil Co.,
Ponca City, Okla.

AN ANALYSIS of the explosion that rocked the Ponca City, Okla., refinery of Cities Service Oil Co. on January 22, 1959, leads to these conclusions:

- Detonation can occur in any process where air is present, through faulty purge procedure or any other cause, assuming the existence of other contributory conditions.
- Startups continue to be the most vulnerable period of any unit operation.
- Startup procedure of old units should be reviewed with reflection on the latest technology. Each addition or deletion to a startup procedure should be studied thoroughly for even the remotest combination of circumstances which might result in hazardous conditions.
- The problems of human error, even with the most experienced operator, still exist. This offers a challenge for better training techniques.
- Side-by-side operating units are undesirable.
- Grating for platforms probably makes less-destructive missiles than floor plate.

When it happened . . . The explosion occurred during a startup of the No. 1 Dubbs unit at the refinery. The No. 2 Dubbs, located in the same area, was full of quench water, awaiting cleanout. The two units had been in service over 30 years, and had probably been brought onstream without mishap over 6,000 times.

The cleanout crew turned No. 1 Dubbs coker over to operations shortly after 9:00 p.m., January 21, 1959.

The evening operator then proceeded to make a check of valve lineups and ram out level and pressure-gage lines prior to filling the unit with oil.

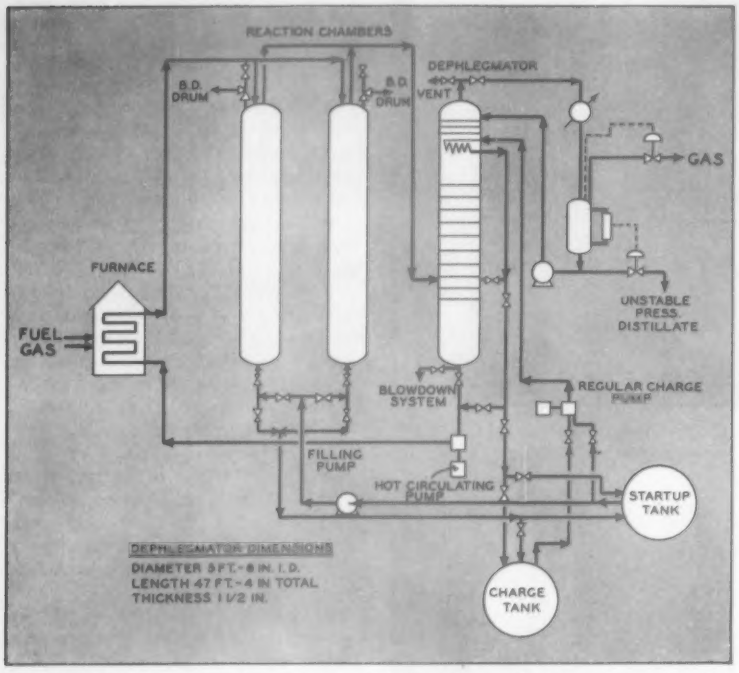
Filling the units completely with oil at each startup has been a long-established practice designed to accomplish three things:

1. Purge air from unit.
2. Permit pressure test for leaking flanges and furnace plugs.
3. Permit check of relief valve operation and set pressure.

The filling process is as follows (see Fig. 1):

A large-volume, low-head centrifugal pump transfers oil from the startup tank to the bottom of the reaction chambers, while a smaller reciprocating pump charges material through the furnace to the top of the chambers. The material used for filling the unit is a blend of decanted oil and tar, coming from storage at a normal temperature of 200° F. On this particular night, because of cold

Paper presented at API annual meeting, Chicago, November 9, 1959.



FIRST MISTAKE in chain of events which led to the explosion was made when vent valve at top of dephlegmator was not opened at the correct time. Fig. 1.

weather (about 10° F.), the oil temperature was down to 150° F., making it quite viscous and difficult to transfer.

Vent valve closed . . . During the filling operation, the vent line from the top of the dephlegmator is open to allow the air to escape from the unit as oil displaces it. On this particular night, the evening-shift operator **failed to open the vent valve** when lining up the unit.

In continuing with the normal filling procedure, after the two reaction chambers are full, oil overflows through the overhead vapor line into the dephlegmator. When the dephlegmator is full, as observed by an overflow of oil from the vent, the vent valve is closed to build pressure to 225 psi. for pressure test and check of relief valves located on top of the reaction chambers. The relief valves on the chambers also provide relief protection for the dephlegmator, inasmuch as there are no valves in the vapor line between the vessels.

After the pressure test is complete, the hot-oil circulating pump is started and furnace fires lighted in preparation for bringing the unit onstream.

Operators change . . . The filling pump had been started only a short time prior to arrival of the hoot-shift operator at 11:00 p.m.

As is customary, the hoot-shift operator proceeded to make a recheck of the unit lineup. This was the start of a series of unfortunate circumstances. The hoot-shift operator, probably in haste to get out of the cold, failed to catch the previous operator's mistake. **The vent valve remained closed.**

Normally, filling can be accomplished in 3 to 4 hours when charge stock is hot and free of coke particles.

The operator observed that the unit was filling slowly. This they attributed to cold charging stock and possible plugging of the filling-pump suction screen with coke fines. Later, around 1:30 a.m., the filling pump began to run hot and was shut down. This hot filling pump was a clue which, if grasped, could have brought about a true diagnosis of the trouble. The filling pump had reached its maximum discharge pressure of approximately 90 psig. due to compression of air in the system. The lack of fluid movement through the pump caused it to become hot.

Two things are probably responsible for the operator's failure to catch the true significance of the hot pump:

1. Filling time had been long on some recent runs as a result of plugging of the suction strainer on the filling pump.

2. The pressures recorded on the suction and discharge of the hot circulating pump, through which the regular charge pump was simultaneously filling through the furnace to the top of the chambers, did not appear to be significantly higher than normal.

After the main filling pump had been shut down, the operators gave conscientious thought to ways of speeding up the filling process. They concluded that lighting a low fire in the furnace would be desirable. In this manner, more oil could be moved through the heater because of lower viscosity and pressure drop. Further, they reasoned that by warming up the charge and furnace, the later operation of "pulling levels" could be facilitated.

Lighting a fire in the furnace at this stage of startup was not normal. However, this had been done on some occasions, with permission of the unit foreman, when the unit was down for an extended period which allowed the furnace to cool abnormally. This, however, was the first time operators had taken the liberty of lighting the fire without approval of the foreman.

In view of the extended unit cleanout time and the low atmospheric temperature, had the request been made, no doubt approval would have been given along with some words of precaution on high oil temperatures.

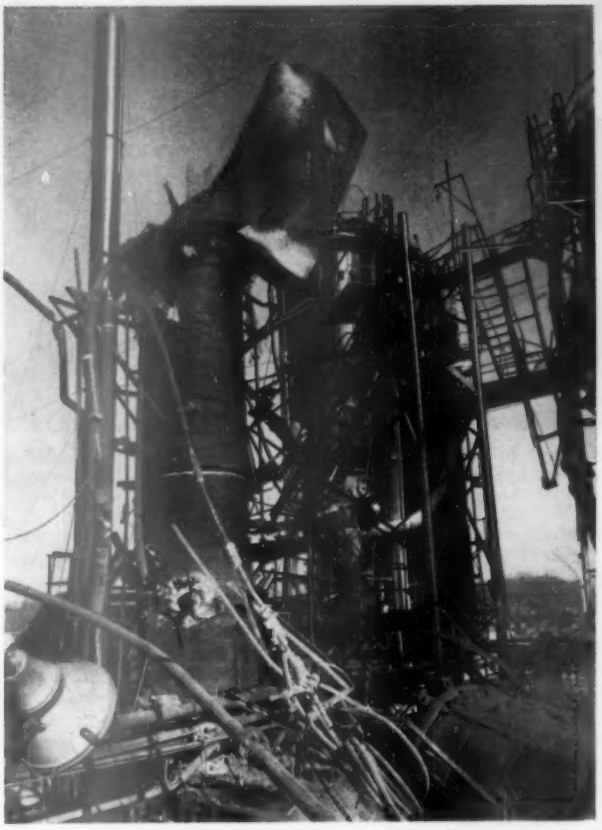
Pressure rise . . . At 4:30 a.m. the pressure upstream of the furnace was 90 psig. and increasing. Charge rate through the heater was approximately 800 bbl. per day, with a low fire still being maintained. No oil had yet overflowed into the dephlegmator as observed from the float-level indicator.

At 5:30 a.m., an oil level was indicated on the dephlegmator-bottoms level instrument. Pressure had increased to almost 130 psig., but had not yet aroused concern. At this time, furnace transfer temperature was observed to be 450° F. Instead of reducing the furnace firing rate, the operators managed to increase the charge to 1,700 bbl. per day, which brought the temperature down to 350° F.

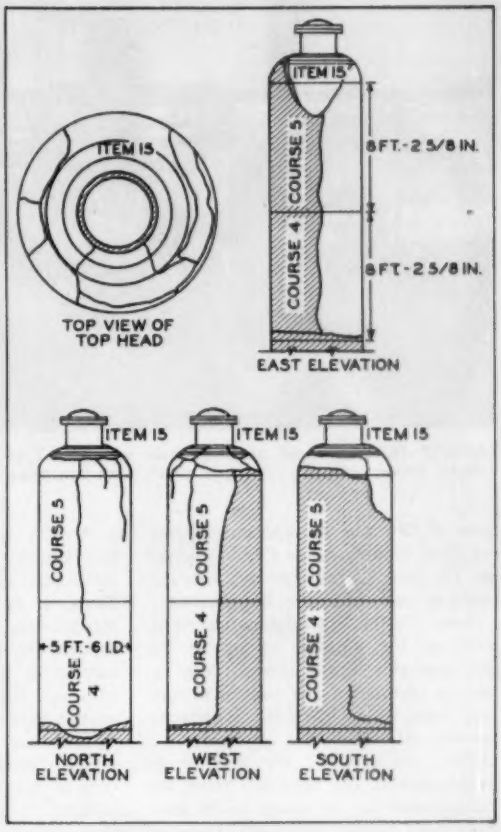
When the feed was increased at 5:30 a.m., pressure at the furnace inlet began to increase at a rate of approximately 6 lb. per minute. The operators did not become alarmed at the first increase in pressure because they attributed the increase to additional pressure drop through the furnace tubes. The pressure continued to rise.

As it approached 200 psig. the operators did become concerned and activated the coke-chamber pressure instrument for a pressure check. This instrument was normally left out of service until after the pressure test to prevent overranging.

When they got their check, the



LEFT STANDING after the explosion was only this much of the dephlegmator.



RUPTURE PATTERN shows disintegration of No. 1 coker from all four sides, and from top view. Fig. 1.

worst was confirmed. Pressure at the top of the coke chamber had reached 200 psig. and was still climbing. Pressure at the furnace inlet had now reached 250 psig.

Now everything was clear to them—either the vent line was plugged or the vent valve itself was closed. The stillman immediately confirmed that the vent valve was closed. No. 1 Dubbs operator was dispatched to open the valve at once. No. 2 Dubbs operator went along to assist.

They found the valve could not be opened by hand. No. 2 Dubbs operator walked around the dephlegmator in search of a wrench. Meanwhile, chamber-top pressure had reached 250 psig. and furnace inlet pressure was 300 psig. It was too late. At exactly 6:00 a.m., January 22, 1959, No. 1 Dubbs dephlegmator was ripped by a violent explosion. The vent valve was never opened.

Cause of the Explosion

There is now little doubt that the explosion was caused by spontaneous ignition of ram-oil vapors in the dephlegmator.

Ram oil is a light gas-oil product produced in thermal cracking operation. It is used in small quantities before each startup to flush out valves, drains, level lines, and pressure connections.

Of the various oils associated with the startup, ram oil has by far the lowest spontaneous ignition temperatures (Table 1). The range is from 469° to 493° F. and it is quite volatile. Approximately 20% is vaporized at a temperature of 450° F.

An analysis of the pressure and volume ratios just prior to the explosion reveals that the compression, under the circumstances, more nearly followed an adiabatic path. With a final dephlegmator pressure of approximately 250 psig., the pressure

TABLE 1—MINIMUM SPONTANEOUS IGNITION-TEMPERATURE DATA AS DETERMINED BY U. S. BUREAU OF MINES LABORATORY

(Spontaneous Ignition Temperature in Air Atmosphere)

Material—	Initial pressure (psig.)	Spontaneous ignition temperature °F.	Spontaneous ignition temperature °C.	Time lag before ignition (seconds)
Dephlegmator residue	0	712	378	2
	100	522	272	25
	250	550	288	10
Ram oil (top, 418 tank)	0	482	250	85
	100	475	246	63
	250	493	256	45
Ram oil (middle, 418 tank)	0	478	248	91
Ram oil (bottom, 418 tank)	0	469	243	64
Dubbs charge (top, 431 tank)	0	838	448	5
Dubbs charge (middle, 431 tank)	0	774	412	3
	100	583	316	2
	250	658	348	3
Dubbs charge (bottom, 431 tank)	0	802	428	5
Sample from No. 1 Dubbs unit, No. 1 level (near draw)	0	770	410	3
Sample from No. 1 Dubbs unit, No. 1 level (far draw)	0	810	432	5

LARGEST FRAGMENT of dephlegmator weighed 7,440 lb., and sailed 100 ft. through the air, narrowly missing an operating stabilizer heater.

TOP-HEAD FRAGMENT of dephlegmator carried 335 ft., into a residential area. It weighed 2,500 lb.

ratio (P_f/P_i) was 18. The corresponding final volume ratios (V_i/V_f) would be 18 and 8, respectively, for isothermal and adiabatic compressions.

Based on the best information available on the amount of oil in the dephlegmator at the time of the explosion (estimated one-quarter to one-half full), the V_i/V_f ratio was approximately 10 when the explosion occurred. Apparently, for this to be accomplished, the heat lost from the compressed air to vessel walls must have been almost completely regained from the hot charge stock.

High temperature . . . A conservative estimate of the final gas temperature near the surface of the hot liquid is 500° F. Thus theory seems to verify that sufficient temperature did exist to both vaporize and spontaneously ignite ram oil.

A very comprehensive analysis of this subject is made by Dr. M. G. Zabetakis in the Bureau of Mines, Division of Explosives Technology, Report No. 3730. Also, in this same report, Dr. Zabetakis duplicates very closely in theory the rates of pressure rise which actually existed prior to the explosion.

The clean fractures of the dephlegmator fragments, free from any thinning at the points of rupture, indicate without doubt that failure occurred through detonation at pressures much higher than would be experienced with slow combustion or deflagration.

The cause of an explosion such as this can never be stated with absolute certainty, but the conclusion that it occurred through spontaneous ignition of ram-oil vapors seems justified. Thus we can reasonably say that, if the human error which resulted in the vent valve remaining closed had been corrected, an explosion would not have occurred because the spontaneous-ignition temperature would not have been reached.

Further, even if the spontaneous-ignition temperature had been reached and the vent valve was open, the magnitude of any explosion would have been greatly reduced because of the smaller quantity of air available for combustion.

Other possible triggering mechanisms considered as possibilities were:

1. Spontaneous ignition of iron sulfide deposits on the top dephlegmator trays.

2. Static spark resulting from movement of liquid and vapor caused by opening of the relief valves.

The latter did appear to have some merit, inasmuch as it seems like more than just a coincidence that the explosion occurred almost exactly at or just slightly above the relief pressure.

GREATER DAMAGE would have been sustained, except that the companion dephlegmator, No. 2, was down for cleanout.

Extent of Danger

When the explosion occurred, three men were in the control room. Two men were at the base of No. 1 dephlegmator, and one man was in the tool house located directly north of the unit.

The burning liquid contents of the dephlegmator spilled out of the ruptured vessel toward the northeast. This was the area in which No. 2 Dubbs operator had walked in search of a valve wrench. No. 2 Dubbs operator was killed instantly. No. 1 Dubbs operator, standing only approximately 15 ft. away on the opposite side of the tower, was miraculously unharmed.

The shock wave and initial wall of flame caused the windows in the north and south ends of the control room to cave in. The three men in the

control room left the building through the west door. Only one minor injury, a head laceration, was inflicted. The man in the tool room could not make exit from the west door because of the flame. He departed through a north window unharmed.

We were deeply grateful that there was no greater loss of life and injury to personnel. In another 2 hours, 16 coke-out men would have been in the area. This would have been a tragedy. It is also very fortunate that No. 2 Dubbs was down for cleanout; otherwise, the resulting fire would have been tremendous. As it was, the fire was not great after the explosion. It was well contained within 15 minutes and completely extinguished in 30 minutes.

The operators promptly isolated the hydrocarbons feeding the fire. This included a gas line to the heater, which was broken, and charge, which was still being pumped to the reaction chambers and overflowing into the dephlegmator. Steam lines, air lines, and many others were broken. Block valves remote from the unit area proved to be very valuable for the prompt containment of the fire.

Fragments of steel from both the dephlegmator and its surrounding platforms and structure were scattered over a large section of residential and refinery area. The weight of each fragment, plus the distance traveled, is shown in Table 2. The largest dephlegmator fragment weighed 7,440 lb. and was carried a distance of 100 ft. It came to rest uncomfortably close to a stabilizer heater which was in operation.

A 2,500-lb. fragment, including the top head of the dephlegmator, was blown 335 ft. into the residential area. This was the largest fragment carried out of the refinery.

Further illustration of the damage caused by the explosion is given in Fig. 2, which shows the rupture pattern of the No. 1 dephlegmator.

Fortunately, there were no major injuries or fatalities in the residential area. There were some minor personal-injury claims and over 600 claims for personal-property damage amounting to over $200,000.

Shrapnel was found up to 1,000 ft. from the base of the dephlegmator. Window damage and plaster damage from the shock wave were reported up to 5,000 ft. and 2,500 ft., respectively.

The Bureau of Mines estimated the explosion to be equivalent to that of 800 lb. of solid explosive. An almost equivalent energy release would be obtained from approximately 6 gal. of oil and the amount of air compressed in the dephlegmator.

TABLE 2—SHRAPNEL PRODUCED BY EXPLOSION OF NO. 1 DUBBS COKER DEPHLEGMATOR

Item No.	Description and Size	Weight (lb.)	Distance from dephlegmator (ft.)
1	2-ft., 6-in. by 3 by 3 by ½-in. L	30	80
2	2-ft., 6-in. by 3 by 3 by ½-in. L	30	75
3	2-in. flanged ell and 3-ft. 2-in. pipe	25	135
4	4 ft. by 8 by 2¼ by ¼-in. C	50	155
5	Hole in stack at elevation of 60 ft.		90
6	Parts of trays	40	110
7	2-ft. section of 3 by 3 by ½-in. L	20	105
8	8 by 30-in. step grate	15	120
9	Parts of trays	35	120
10	Parts of trays	30	100
11	Parts of trays	50	95
12	2-ft. section of 3 by 3 by ½-in. L	20	300
13	3 by 5-ft. floor grate	153	330
14	3-ft. section of 2 by 2 by ¼-in. L	10	345
15	Head and part of shell	2,500	335
16	3 by 5-ft. floor grate	78	430
17	3 by 5-ft. floor grate	150	200
18	Parts of trays	30	160
19	2-ft. section of 2 by 2 by ¼-in. L	20	365
20	3 by 5-ft. floor grate	150	305
21	6-in. section of 3 by 3 by ½-in. L	5	460
22	3-ft. 6-in. section of 3 by 3 by ½-in. L	35	1,000
23	6-in. section of 3 by 3 by ½-in. L	5	306
24	5-in. section of 3 by 3 by ½-in. L	3	355
25	1 by 3-ft. floor grate	30	245
26	4 ft. section of 3 by 3 by ½-in. L	35	170
27	2-ft. section of 3 by 3 by ½-in. L	20	455
28	6-ft. section of 3 by 3 by ½-in. L	50	175
29	12-ft. section of 2 by 2 by $\frac{5}{16}$-in. L	30	150
30	2-ft. section of 2 by 2 by ¼-in. L	5	150
31	4-ft. section of 2 by 2 by $\frac{5}{16}$-in. L	10	150
32	2-ft. 6-in. section of 3 by 3 by ½-in. L	30	135
33	4¾ by 26-ft. shell	7,440	100
34	3-in. Ga. V. and C. V. and pipe	100	165
35	1 by 3-ft. floor grate	30	130
36	20 ft. Schedule 80, 2-in. pipe	100	75
37	1-ft. 6-in. section of 3 by 3 by ½-in. L	20	455
38	1-ft. 4-in. section of 3 by 3 by ½-in. L	16	675
39	3-ft. 8-in. section of 3 by 3 by ½-in. L	30	660
40	2-ft. 6-in. section of 3 by 3 by ½-in. L	24	575
41	1-ft. 6-in. section of 3 by 2 by ¼-in. L	6	400
42	3-ft. 6-in. section of 3 by 2 by ¼-in. L	28	360
43	8-ft. section of 3 by 3 by ½-in. L ⌇	70	375
44	8-ft. section of 2 by 2 by ¼-in. L ∫		

Note: L = angle iron. C = channel iron. Ga. V. = gate valve. C. V. = control valve.

Some Reflections

The hazard of air in refinery processing cannot be overemphasized.

In this case of human error which resulted in the explosion of No. 1 Dubbs dephlegmator, one cannot help but wonder if it could have been avoided through better training techniques. Through the years, had the operators, in their own minds, been filling the unit to pressure test only?

How would it be possible for an operator to forget to open a vent valve if, through the years, it had been instilled in him that the unit was being filled to purge the air and prevent explosions? Yet, when we later questioned various operators about how important they thought it was to have the vent valve open when filling, they all, without exception, knew that it was absolutely essential, and why.

This experience also reveals that we must beware of the seemingly harmless changes in operating procedure which may grow out of some particular expediency.

There is a tendency, too, to say, "Well, it must be a good startup procedure; it has worked for over 30 years." Has it worked because it is right, or have the odds failed to catch up?

We must be frank and admit that, as a result of this explosion, we have reviewed our operating procedures on other units and have corrected two unsafe practices which have been in effect for years on the two oldest units in the refinery. In one case, a stabilizing unit was being purged by displacing air with gas rather than first purging with steam and then breaking with gas. The other case involved a startup procedure on a thermal cracker where air was being displaced with hot vapors generated in the process of circulation.

Bottom-hole heating spells the difference in California's heavy-oil development program

BY D. H. STORMONT
West Cost Editor

BOTTOM-HOLE HEATING is carried out by gas-fired heaters which supply hot water to four wells. Where field gas is not available, butane is used as fuel.

IN CALIFORNIA, Tidewater Oil Co. has completed the first phase of a development and well-stimulation program which is noteworthy because of the key role played by bottom-hole heating.

Heat is being applied to more than 340 Tidewater wells at Kern River, Midway-Sunset, and other low-gravity fields in California's San Joaquin Valley. Its use is causing a production increase of approximately 5,000 bbl. daily.

Units run in older wells increased their output from 2,200 to about 5,000 bbl. daily. In addition heaters have been installed in 115 of the approximately 150 new wells drilled there this year. These wells in early September were producing about 4,000 bbl. daily, of which more than half was caused by bottom-hole heating.

Results varied from well to well. Some showed no response while others doubled or tripled in oil output. For the older wells the average daily oil increase has been about 13 bbl. Most new wells produce in the 20-to-25-bbl. range when heated, and drop to about 15 to 25 bbl. of oil daily when the heat is cut off. The high success rate is due to the care with which wells are screened before heat is applied. This assures, as much as possible, that a well will respond to heat before a unit is placed in the well.

This phase of the program has included many test wells, so that the effect of heating could be observed and evaluated in many areas.

The next phase will consist largely of in-fill drilling, with plans calling for approximately 400 new wells. Heaters will continue to be installed in many older wells as they are reworked.

Drilling program . . . Tidewater embarked on the program of developing low-gravity production early this year to obtain additional supplies for its Avon, Calif., refinery. Most of the work has been on fee-owned properties, some of which were not fully drilled even though first development occurred many years ago.

A total of 150 wells had been drilled by September 1, a summary of which is given in an accompanying table. As shown, most of the drilling has consisted of 1,000-ft. wells at Kern River. Average initial and recent production figures are given but individual well outputs varied greatly from these averages. Some wells initially produced as much as 100 bbl. daily while others could not make 10 bbl.

The Kern River work is particularly interesting because of its fast drilling. The 1,000-ft. producers were drilled and completed in an average of 24 hours. Much of the drilling was done on a turnkey basis.

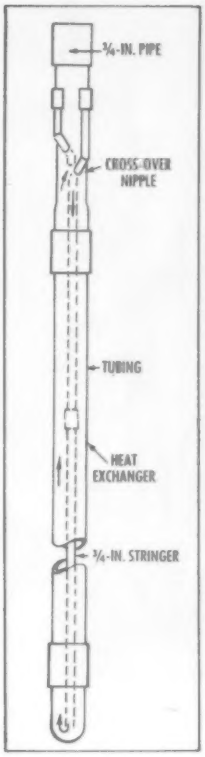
As a rule the contractor would spud in only 2 or 3 hours after moving onto the drill site. Actual drilling time was only a matter of a few hours. As fast-setting cement (HA-5) was used, water shutoff tests on the casing could be made some 2 to 4 hours after cementing.

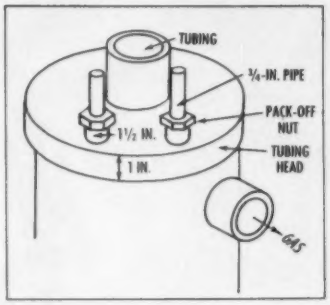
In the early stages of the Kern River drilling program, liners with 180-mesh slots were run. Now it is believed that 80-mesh provides better sand control.

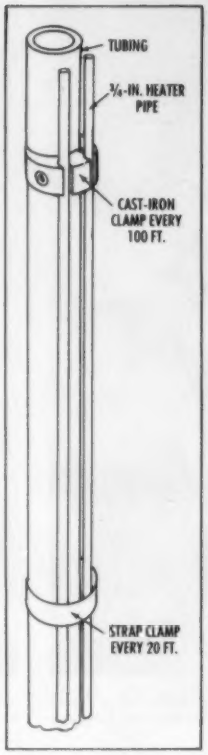
Tubing then is run with a heat-exchanger section placed below the pump. As the tubing is run it is tied to the two ¾-in. water-circulating strings, using cast-iron clamps every 100 ft. and steel bands at 20-ft. intervals (see diagram).

Completing the McKittrick and North Midway wells required several days, because of flowing sand conditions. About 3 days were required for the 1,200-ft. McKittrick wells, and 6 days for the 1,500-ft. North Midway producers. In the latter, 2 to 3 days were required for placing the gravel pack.

Design of heating units . . . Tidewater has fairly well standardized on a surface heating system which circulates hot water to four producers. The heater is placed as near as possible in the center of the four wells and 1-in. supply and return lines run to each well. Gas lines also are connected. Few of the wells produce







WELLHEAD and bottom-hole-heating equipment is largely fabricated in Tidewater's Kern River shops in order to hold costs down. Shown here are: (left) the down-hole heat exchanger, (center) the modified tubing head, and (right) the clamps used to tie the two macaroni strings to the tubing.

any gas when unheated. But after heat is applied they often yield enough to become self-sufficient.

Gas heaters used are of the coil type with a heat output of about 1,250 M. B.t.u. hourly. As an accompanying photo shows, they are packaged with a motor-driven water-circulating pump, water makeup tank and safety controls. Where gas is not available, butane is used as fuel for the hot-water heaters. No electric bottom-hole heaters have been run.

In keeping with the semidepleted nature of the development, landing heads used are quite simple. In addition to the 2-in. opening for the tubing, 1½-in. holes are provided for the water lines (see drawing). Shop-made packing glands prevent the escape of gas and conserve it for use as boiler fuel.

The heat exchanger run to the bottom of the well likewise is of quite simple design, as an accompanying diagram shows. A bull plug is placed on the bottom of the last section of tubing which will serve as an exchanger, and a crossover nipple attached to the top. The shop-made nipple is equipped with ¾-in. fittings which circulate hot water down through the ¾-in. stinger and up through the tubing annulus.

Selection of wells to be heated . . . Of the wells selected for bottom-hole heating, more than 85% have proven economic. Mechanical problems were the principal reason heating was not successful in the others.

The high success ratio can be attributed to the careful choice of wells. Before a well is equipped for bottom-hole heating, these requirements must be met: (1) The well must be producing less than 100 bbl. of water daily, (2) its sand production should be low, and (3) condition of the liner is satisfactory so a heater can be run to near bottom.

Viscosity-temperature relationship—the factor which probably more than any other determines the success or failure of bottom-hole heating—does not particularly enter the decision. Nearly all of the development and well-stimulation work is occurring in fields producing low-gravity, viscous crude. Kern River crude, for example, at reservoir temperatures of approximately 100° F., has a viscosity of 7,000 S.s.U. Heated to 210° F., the viscosity drops to 200 S.s.U. or less.

Economics of heating . . . As stated earlier, installation of heaters in older wells has resulted in their oil output being stimulated from approximately 2,200 bbl. daily to 4,900 bbl. daily in early September. As an accompanying table shows, this is exclusive of the production increase gained from drilling new wells.

For the entire program, heating is giving an average increase of 13 bbl. daily in reworked wells. Kern River wells average 12 bbl., McKittrick wells 16 bbl., and Midway reworks average 10 bbl. higher. Those at North Midway make 20 bbl. more.

Results from installing heaters in 112 of the 150 new wells drilled this year were somewhat similar to these averages. The average Kern River

LOW GRAVITY of Kern River crude permits open pits such as this to be used for dropping out sand and separating the large volumes of fresh water.

HYDRAULIC PUMPS, such as this 3-ft.-stroke unit, have been installed on most new wells. All gas produced from bottom-hole heating is needed for fuel.

MODERN WELL-SERVICING UNITS are used to pull Kern River wells whenever they sand up. To speed up servicing, hydraulic tubing tongs and air-operated slips are used.

well had an initial production, with a heater installed, of about 30 bbl. daily. Without bottom-hole heat these wells would make less than half this amount. Average initial for all new wells was about 33 bbl. per day, or some 5,000-bbl. total.

From the viewpoint of reserves, the revived drilling program is estimated to have added about 15,000,000 bbl. The average Kern River well is credited with a reserve addition of almost 100,000 bbl. Those in North Midway added almost twice this amount. Despite their low daily output, the new producers are expected to have a productive life of 30 to 40 years.

Cost of drilling and completing the new wells varied widely, depending upon the field and whether or not they were development or semiexploratory. The Kern River infill wells cost just slightly over $13,000 each and about $14,500 if they were test wells. Average McKittrick wells cost about $17,000 while the deeper, more difficult North Midway producers ran about $30,000.

Cost of equipping a well for bottom-hole heating averaged about $1,700 per well where four-well units were used. This included cost of the heater, that of the water circulating and gas strings, and the time and expense of the well-pulling crew.

The average fuel cost for heating a well is about $2 per day with four-well heaters. This is based on a gas consumption of about 26 M.c.f. for each four-well unit, with the gas valued at 30 cents per M.c.f. Since the wells produce no gas if they are not heated, and are largely self-sufficient when heated, a value somewhat lower could be placed on the gas.

Where sufficient field gas is not available and butane is used, the cost climbs rapidly. Even with a four-well heater the per well fuel cost is almost $10 daily (based on butane at 14 cents per gal., and 10 gal. of butane equivalent to 1 M.c.f. of field gas).

Tidewater engineers, because of the rush connected with the large program, have not had time to estimate the over-all per well heating cost. As a rough measure, however, a 3-bbl.-daily increase is regarded as a minimum for wells where field gas is available. Heating must increase a well's oil production by almost 10 bbl. daily, they figure, if butane is to be the fuel.

Well performances . . . Wells respond so differently to heating that averages are almost meaningless. In some instances one which can pump only 1 or 2 bbl. daily unheated will jump to 20 or 35 bbl. when a bottom-hole heater is run. Another such well will show no response.

Some wells likewise will show a good jump immediately after heat is applied. On the other extreme, one will show only a small immediate increase but will continue to build up for a year or more. Each well, in effect, offers a new challenge.

Once a well's output peaks under bottom-hole heat stimulation, the decline which follows will be about the same as that of an unheated well. One interpretation which could be made of this observation is that the added oil production would otherwise not have been produced. Needless to say, all engineers do not agree with this deduction.

Heating problems . . . After having applied bottom-hole heat to some wells for more than 3 years, Tidewater's experience has been that the practice leads to greater sand problems. The problem of wells sanding up is encountered in all Valley low-gravity fields. Addition of heat aggravates the problem.

The length of heating section which can be run in Kern River wells frequently is governed by sand conditions and fluid levels. Some wells can be equipped with 180-ft.-long exchangers. In others heating is limited to a 10-ft. exchanger.

To combat the sand problem, pumps are always set high when heaters are run. This practice not only lessens the chance of the heater being sanded

TABLE 1—RESULTS OF 1959 DRILLING IN VALLEY FIELDS

Field and approx. comp. date—	Approx. depth, ft.	Average prod. per well, B/D—Initial—Oil	Initial—Water	Mid-August—Oil	Mid-August—Water
Kern River:					
35 develop. wells—Feb.-April	1,050	38	30	29	16
10 infill wells—April	1,045	52	19	41	10
35 test wells—May-June	980	20	33	15	34
McKittrick:					
13 develop. wells—February	1,210	27	4	26	3
4 test wells—June	1,490	8	2	7	1
4 test wells*—July	1,910	23	19	16	22
North Midway:					
10 develop. wells—March	1,670	76	5	73	5
9 test wells†—May	1,620	39	26	35	24
10 test wells†—June-July	1,680	55	9	16	13
Coalinga:					
13 test wells—May-June	2,790	39	14	25	17
Poso Creek:					
3 test wells—May	2,500	26	99	43	326
Lost Hills:					
1 test well—April	315	5	3	3	2

*Includes two wells abandoned upon completion. †Includes one well abandoned upon completion.

in, but it also results in a column of hot fluid being maintained along the sand face. Effect of the high fluid column is threefold: (1) Heat is applied more uniformly to the formation, (2) less sloughing occurs, and (3) chances of charring or dry up are lessened.

Another effect of the high fluid column, of course, is to reduce the flow of oil into the well bore. In most Kern River wells the pump is generally lowered about two times. Lowering the tubing requires only an hour or so, as compared with the two or three tours needed if the pump sands up and has to be pulled.

Because of the frequency with which wells sand up and other well repairs must be made, nine Tidewater well-servicing crews are kept busy at Kern River, Midway, and other Valley fields. Work they are unable to do is contracted.

Crews make every effort to get wells back on production as quickly as possible. For this reason some masts are equipped so the rods, tubing, and both macaroni strings are either suspended or racked. None of the strings are laid down. To speed up the pulling and running operations, all units are equipped with hydraulic or pneumatic tubing tongs and air-operated air-spider slips.

The air spider is adapted so the three-string bundle can be run through the slips, with the ¾-in. strings passed up through the spider on the outside of the slips. To set the slips after the pipe is lowered in the well, the ¾-in. lines must be held away from the tubing.

As the doubles of ¾-in. run longer than singles of 2-in. tubing, tops of the ¾-in. at times extend above that of the tubing. This does not interfere with the use of the tubing tongs, however, as the macaroni strings can be pulled away from the tubing. Tubing elevators are used in running the tubing but the ¾-in. is picked up manually by the derrickman and floorman.

Insofar as operation of the heaters is concerned, the biggest problem has been the formation of scale. This is particularly true in portions of the Kern River where fresh oil field water is used.

In general, outlet temperatures of about 230° F. are maintained on the heaters, with the water being returned at about 215°. Use of such elevated temperatures has caused substantial scale deposition in the coils. Scale inhibitors are used but so far they have given only fair results.

Future work . . . Success of this first phase of the program will lead to the drilling of at least 400 more wells during the next few years. Most of Tidewater's properties in Kern River, Midway, and other Valley heavy-oil fields have been developed to approximately 2½-acre spacing. The new wells will be infilled in those areas where the test installations proved most successful.

Tidewater also has embarked on a program designed to evaluate the efficiency of various completion and producing practices. A total of 18 wells will be drilled at Kern River, some as five-spot wells and others as twins. The latter will seek zones not presently producing. In addition to providing information on proper well spacing, the program will evaluate the effect of high water production in the central portion of the field.

During coming months Tidewater engineers also expect to materially increase the output of many wells already being heated. Because of the pressure created by such a large drilling and well-stimulation program, there was not always sufficient time for pumps and exchangers to be adjusted at depths where they would yield maximum oil increases. By properly positioning the heater and the pump in all wells, further increases in oil production are expected.

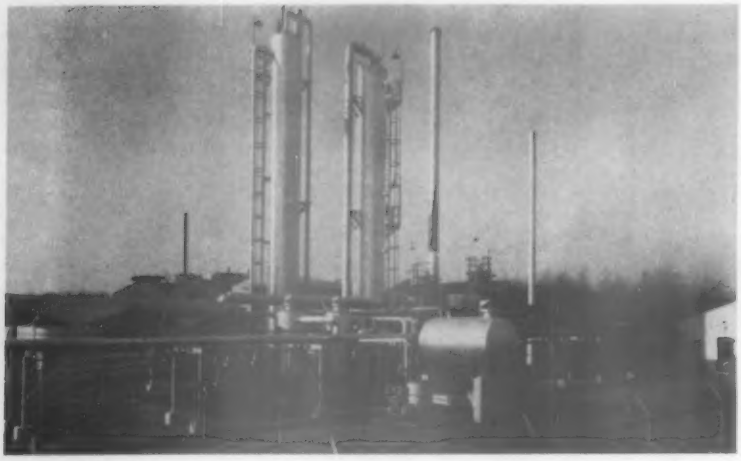
TABLE 2—WHERE HEATERS ARE INSTALLED AND RESULTING OIL PRODUCTION INCREASES

Field—	Installed before 11-1-58	No. added this year to Sept. 1	No. run in 1959 drilled wells	Total, as of Sept. 1	Oil prdouction, bbl. per day—Before installation	Oil prdouction, bbl. per day—Current output	Oil prdouction, bbl. per day—Increase, exclusive of new wells drilled
Kern River	59	124	75	258	1,088	3,081	1,993
McKittrick	3	25	13	41	617	1,052	435
Midway		19	1	20	265	443	178
North Midway	5		23	28	245	347	102
Total	67	168	112	347	2,215	4,923	2,708

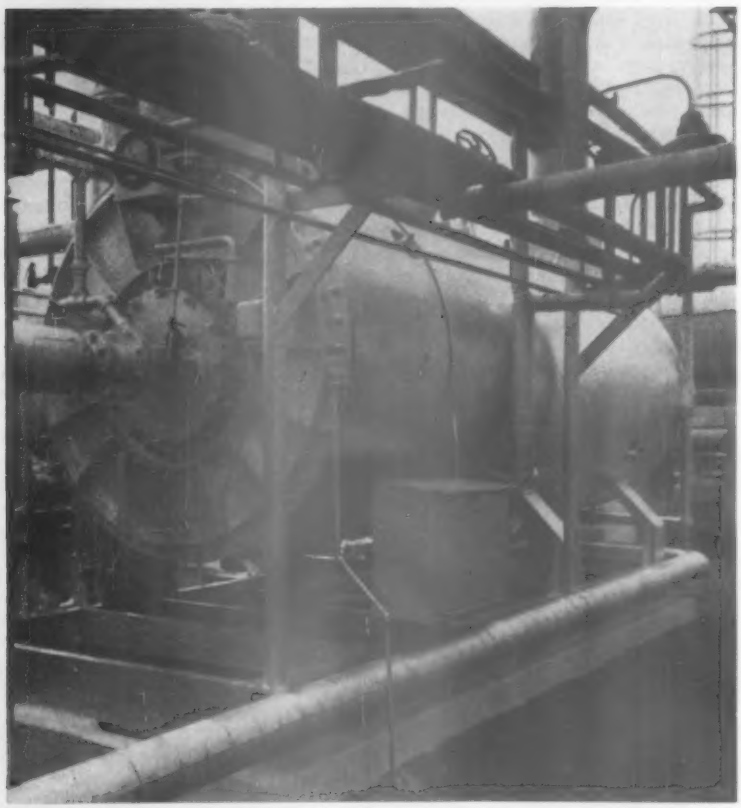
This sulfur-recovery plant uses
a combination process scheme for . . .

Simple removal of H_2S

from refinery tail gas



THIRTY-FIVE TONS per day sulfur-recovery plant serves The California Co.'s Perth Amboy, N. Y., refinery.



HEART of the simplified sulfur-recovery unit is this high-efficiency water-cooled boiler-burner unit, supplied by Ames Iron Works, Inc. It was specifically designed for sour-gas operations.

A SULFUR-RECOVERY plant serving The California Co.'s Perth Amboy, N. J., refinery is using a simplified process-scheme in removing sulfur from refinery tail gas. The preliminary oxidation step has been combined with a waste-heat-recovery boiler into one compact unit.

Heart of the packaged installation is a new high-efficiency water-cooled boiler - burner unit, specifically designed for sour-gas operations by Ames Iron Works, Inc. The combustion step is easily modulated, making it possible to maintain high-efficiency yields at reduced throughputs.

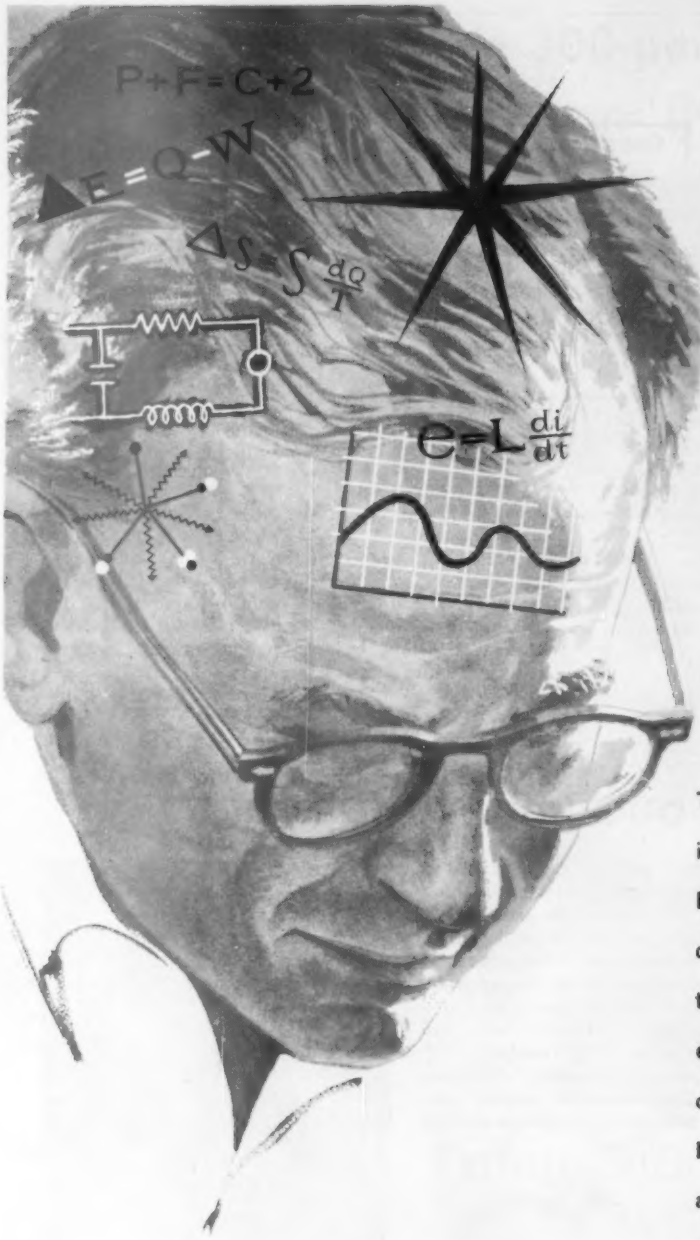
This, of course, is a considerable improvement over refractory-chamber methods. In these cases maximum recovery is based on operation at design capacity, and a serious dropoff in sulfur production is experienced at other flow rates.

The new operation is basically a modified Claus process which calls for the partial combustion of gases containing H_2S. One third of the sulfur contained as H_2S in the gas stream is burned to sulfur dioxide. The entire stream is then catalytically reacted to complete the oxidation and recover elemental sulfur. The process flow continues from the catalyst converter through an economizer and then into a sulfur scrubber, as shown in the accompanying flow diagram.

Flue-gas system . . . The distinctive feature of the process is the flue-gas mixing system on the boiler. A side-stream is taken after the second pass within the boiler and mixed with the final flue gas to maintain a constant temperature of the effluent. This makes it possible to maintain a constant temperature on the feed-stream entering the converter and results in higher yields.

Experience with refinery operations has indicated that manually operated control valves are satisfactory in this step since the composition of the gas is relatively stable. Hence extensive instrumentation is not necessary to maintain constant gas temperature, thereby making the unit that much less expensive.

Byproduct steam is generated within the unit and no additional waste-heat recovery equipment is required.



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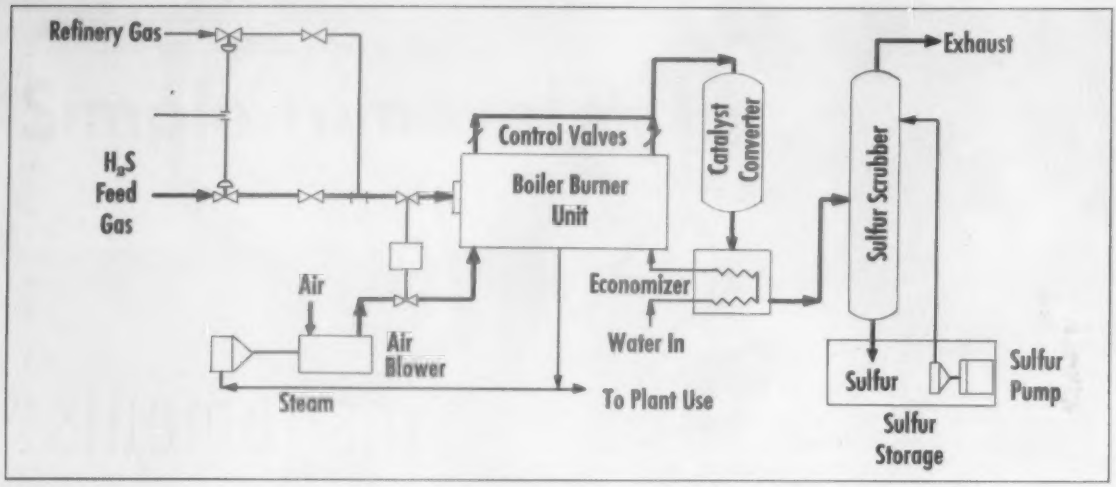


SCHEMATIC of the Perth Amboy sulfur-recovery plant shows use of Ames H_2S boiler.

On small-scale operations, Ames engineers say normal recovery yields are limited to 85-90%. This is because temperatures within the boiler are somewhat difficult to control. Higher yields are possible in large-scale installations if additional catalytic steps are installed.

The unit serving the Calco plant is rated at 35 tons per day and was installed by the Anlin Co. Similar units can be built by paralleling facilities so that larger plants—150 tons per day and up—can be built for use in handling large volumes of gas, as needed.

At British Petroleum's Kent refinery . . .

New burner resists buckling, corrosion

AN IMPROVED flare stack burner developed by British Petroleum Co. counteracts the buckling and corrosion of conventional heads.

The new burners, which are covered by British and foreign patents, have been in trouble-free service for over 5 years at British Petroleum's Kent refinery. Conventional stainless steel burners have only had a life of 1 year.

Key to the improved burner is a wind deflector consisting of vertical metal slats set at intervals around the burner head. The top of each slat is curved toward the flare tip.

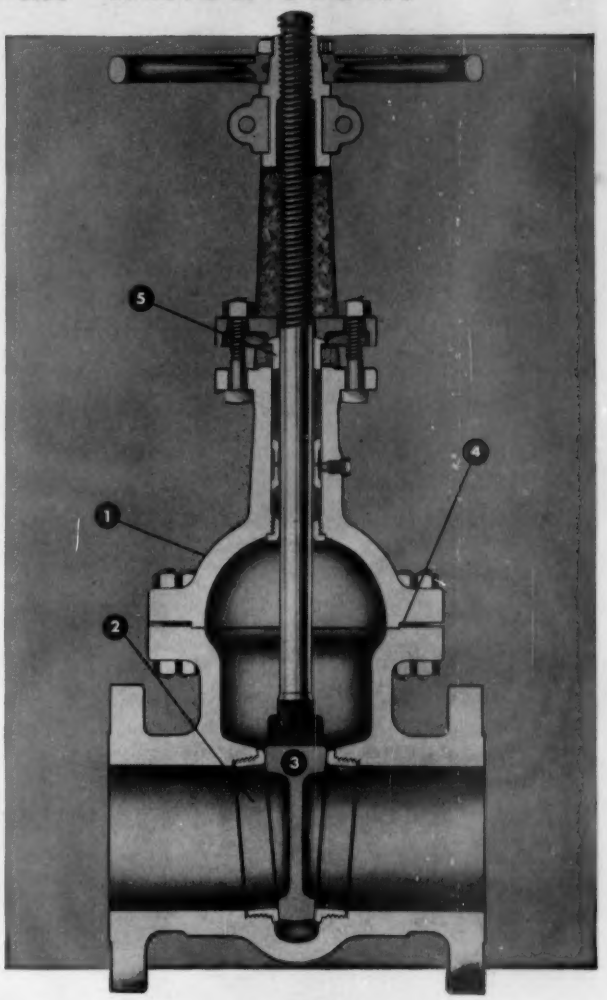
The slats provide a high degree of wind deflection, and at the same time allow air to flow to the burner head. This prevents the formation of a low-pressure zone on the lee side, and at the same time aids cooling.

The design completely eliminates flame licking under all weather conditions, and greatly lengthens the life of the burner head.

NEW TYPE of flare stack burner uses metal slats set around the burner head. Each slat curves inward toward the flare tip, providing considerable wind deflection.

CONVENTIONAL flare stack burner shows the effects of buckling and corrosion after use.

Crane quality in 300-pound steel gates is no secret... just an "INSIDE STORY"



And here *is* the inside story—why Crane 33X steel valves are the first choice in refineries . . . why they stay in service longer, perform dependably and require little maintenance:

1. Body, bonnet—Crane cast carbon steel—with ample metal at points of stress.
2. Replaceable body seat rings of Exelloy*.
3. Disc and stem made of Exelloy*.
   *Crane Exelloy (12% chromium) in body seat rings, disc and stem is your assurance of maximum wear-resistance and strength. Crane valves with Exelloy trim last longer, need minimum maintenance and postpone replacement far longer than valves which do not have Exelloy protection.
4. Self-centering, male and female bolted, gasketed bonnet joint assures a strong, tight seal.
5. Two-piece ball-type gland and gland flange exert even pressure on packing without binding stem.
6. Exceed API and ASA requirements in design and materials for cast steel gate valves.

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Crane 33X, 300-pound, flanged end, cast steel gate valve.

Performance proved!

"Crane 33X, 10-inch gates—still in use after 13 years on absorption oil heater lines with only minor routine maintenance." *Texas gasoline plant.*†

"Crane 33X, 18-inch gates—*end long-standing leakage problem*—now in service 3 years without leaks, and no maintenance whatever." *Southwestern butadiene plant.*†

"Crane 33X, 6-inch gates *handle 800° F. oil 4 years* without leaking—still close tightly, easily." *Oklahoma refinery.*†

"Crane 33X, 8-inch gates *control 600° F. oil on crude oil unit* 8 years without maintenance." *Ponca City refinery.*†

"Crane 33X, 6-inch gates *still seat tightly, operate smoothly after 11 years on 750° F. line to pump for tar stripper bottoms.*" *Southwest refinery.*†

†Complete data, with names of users, available on request.

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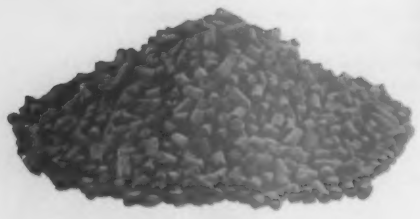

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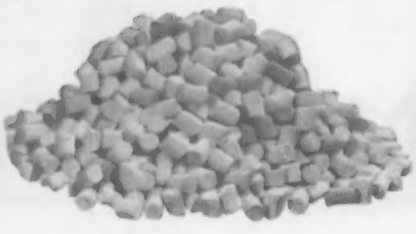

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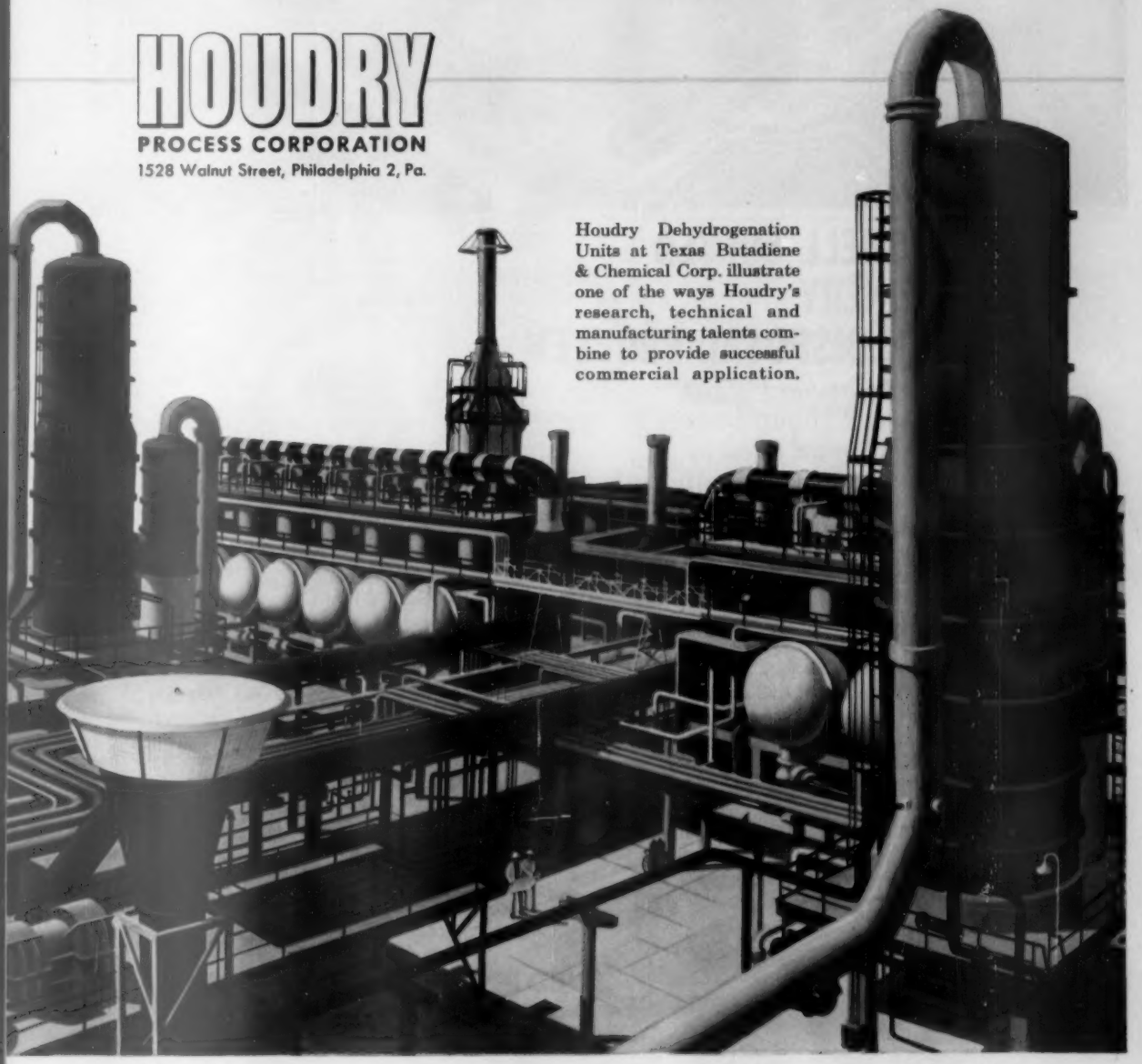

Houdry Dehydrogenation Units at Texas Butadiene & Chemical Corp. illustrate one of the ways Houdry's research, technical and manufacturing talents combine to provide successful commercial application.

Aerial view of treatment plant shows Dorrco Clariflocculators in left foreground, and Clarifiers at upper left. Distributor is at upper right.

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BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Questions on TECHNOLOGY

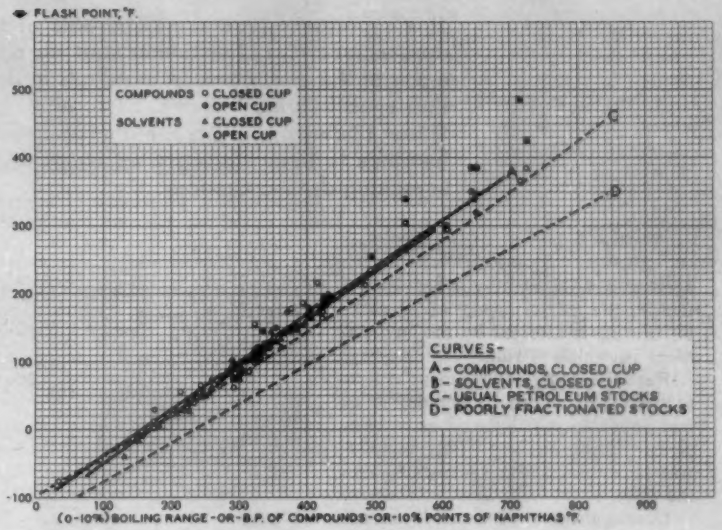
Relationship between flash point and boiling range

Will you please give me references or data published in your Questions on Technology on the approximate relationship of Tag OC and Tag CC flash points of low-boiling petroleum naphthas and relation of Cleveland OC to Pensky-Martens flashes for high-boiling distillates. Any kind of relationship connected with the IBP and 10% distilled points or the like would be helpful. C. C. A.

In the September 1, 1938, issue, page 42, of The Oil and Gas Journal, the dashed curves marked C and D on Fig. 1 were published and there has been no need to revise them since that time. They show the approximate relationship between flash point and the average of the zero and 10% distilled points. Kind of flash test need not be specified because the proper test method (for each boiling range) is used almost universally throughout the industry.

As a further check, Curve A shows the approximate closed-cup flash points of hydrocarbon compounds plotted against their boiling points, and Curve B relates the closed-cup flash points of solvents with their 10% distilled temperatures. These two curves (A and B) indicate quite clearly that there is scant hope of substantially improving flash point by superior fractionation because the ultimate in fractionation is a single compound, and compounds have scarcely higher flash points than naphthas. Thus to increase flash point requires an increase of the boiling range (i.e., 10% point).

Although Fig. 1 indicates higher open-cup flash points than those obtained in closed-cup equipment, the situation is not entirely clear. Accordingly, the closed and open-cup



APPROXIMATE RELATIONSHIP between flash point and boiling point (or boiling range). Fig. 1.

flash points of 94 compounds or materials listed on pages 333-338 of "Safety in Petroleum Refining . . .," by Armistead were compared:

Closed-cup flash points, °F.:	Open-cup minus closed-cup flash point, °F. Average	Range
0-100	13	2- 38
100-200	26	3- 85
200-300	44	5-120
300-400	38	5-135
400 and up	97	55-135

It is obvious that great variations occur, that higher flash points are obtained with the open-cup testers, and that a larger difference in flash point by the two kinds of testers occurs with high-boiling materials. Nor do these results check well with other data in the literature such as Table 1 (page 624 of Vol. I, Day, Handbook of the Petroleum Industry, 1922), and the following tabulation (Cross, Handbook of Pet. Asphalt and Natural Gas, page 662):

ASTM, closed (Tag)	100° F.
Elliott or N.Y. closed	100-105
Abel	102-106
Abel-Pensky	102-105
Pensky-Martens	102-106
Tag open-cup	108-112
Cleveland open-cup	110-115

TABLE 1—COMPARISON OF FLASH TESTS BY DIFFERENT INSTRUMENTS

Material—	Abel	Tag closed tester	Elliott	Pensky-Martens	Cleveland open cup	Luchaire* (French)	Fire test
Naphtha	86	92	92	95	100	100	110
Naphtha	94	103	98	105	115	122	130
Water-white kerosine	127	130	128	135	140	138	160
Petrolite	142	139	140	150	155	144	175
Gas oil	...	...	...	195	200	198	220
300 oil	...	...	...	255	265	266	305
Straw oil	...	...	...	315	325	322	385
Ice-machine oil	..	...	...	400	385	402	460
Engine oil	...	...	...	430	440	430	515
Cylinder oil	...	...	...	505	525	507	610
Heavy cylinder oil	..	...	...	510	560	510	635

*The Luchaire flash points have been calculated to Fahrenheit.

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Why rock-bit bearings fail

BY G. R. KING

This important report sums up years of testing work done on rock-bit bearings. The author and his associates learned that many of the most common materials in drilling mud drastically shortened bearing life and, as a result, hike the cost of wells. These findings have led many to believe that sealing bit bearings to keep drilling fluid out is the next important step in making drilling cheaper.

MORE THAN by any other known factor, the performance of a rock-bit bearing is affected by the environment in which it runs.

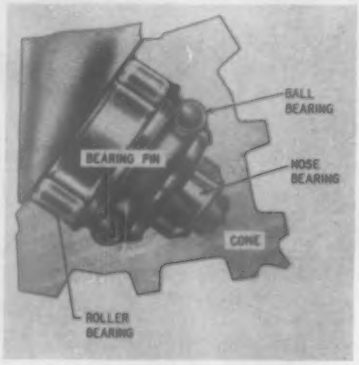
Here the term "environment" refers to the combinations of liquids, gases, and solids to which bearings are exposed during drilling. This includes water, mud solids, chemicals, and the like.

Development work carried on over a period of years has shown these effects on bit bearings:

1. Water. Water itself has a specific effect. Roller races nearly always spall when water is present. Roller races scale when run with dry air; but when enough water is injected into the air stream to wet the race, it then spalls.

2. Hydrogen sulfide. Aqueous environments containing hydrogen sulfide are the most destructive known. To some extent, steel adsorbs hydrogen from reaction with water, but the adsorption is aggravated by specific poisons such as hydrogen sulfide. Adsorbed hydrogen promotes subsurface cracks which results in spalling.

Author is laboratory director, Hughes Tool Co., Houston. Paper presented at 1959 annual meeting of American Association of Oilwell Drilling Contractors, Oklahoma City.



ANTIFRICTION BEARING STRUCTURE as developed in the early 1930's. Fig. 1.

3. Mud solids. The detrimental effect of some suspended solids in muds probably can be attributed to small quantities of agents that promote the hydrogen reaction. Certain kinds of suspended solids can be beneficial. For example, bearings run longer when bentonite or small quantities of barite are added to tap water. Although 10 to 15% by volume of barite is detrimental in aqueous environments, this amount of barite in oils increases bearing life; this is probably because the barite acts as a coating agent to prevent metal-to-metal contact in the bearing. Silica flour has a beneficial effect, likely because it is abrasive and an abraded surface is not as receptive to hydrogen adsorption as a polished, cold-worked surface.

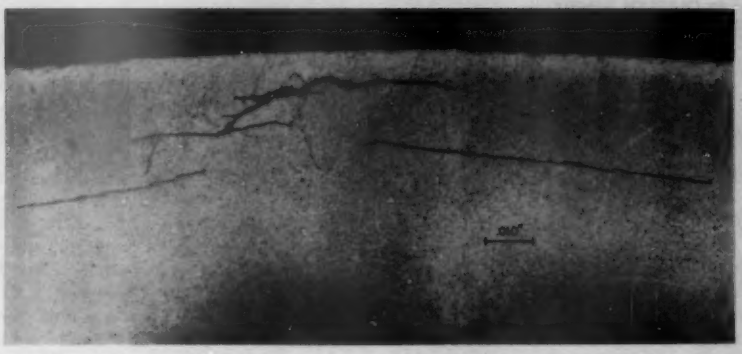
4. Caustic-quebracho. When added to standard barite mud, caustic-quebracho had no effect. But when it was added to water containing low-yield clays, bearing life was reduced.

5. Tannins, lignins. All eight lignin and tannin preparations tested were quite destructive; bearing life with these averaged about 20 hours compared to 53.4 hours with a standard salt-water mud.

6. Bit weight. Bearing life is inversely proportional to weight raised to some power which can be determined for the particular environment. When bits are run in a destructive environment and bearing life is short, reducing weight will not substantially increase bearing life. Hence, an increase in weight to make the bit drill faster might be more economical than a reduction in weight to make bearings last longer.

7. Rotary speed. Bearing life is inversely proportional to rotary speed. Therefore, bearings run a certain

PIN-RACE WEAR resulting from spalling. From left to right, the roller races are worn 0.005, 0.007, 0.020, 0.074, and 0.175 in. Fig. 2.



SYSTEM OF CRACKS developed in a section perpendicular to a pin race. Bearing had run several hours with a mud containing sulfide. Fig. 3.

number of revolutions regardless of the rotary speed.

How Bearings Wear

Although, as Fig. 1 shows, a rock-bit bearing assembly consists of a roller bearing, a ball bearing, and a friction bearing, the life of the roller bearing usually determines the life of the bearing assembly. Under actual drilling, loads on the three bearing elements are constantly changing as the bit rotates, but the roller bearing usually carries most of the load; the ball bearing and the nose bearing do not wear appreciably until the roller bearing starts breaking down. For these reasons, roller-bearing tests are used in the laboratory to evaluate the performance of rock-bit bearing assemblies.

In a roller bearing, the pin race, the cone race, and the rollers are all subjected to heavy loads. However, a unit of area on the pin race, being stationary, is loaded many more times than an equivalent area on the rotating cone race or an the moving rollers; therefore, it is the pin race that wears out. The hard, carburized surface of the pin race retards wear until it is gone, then the softer metal below wears rapidly. Bearings might be called "worn out" when the pin race is worn about 0.050 in., but it is not uncommon for a bit bearing to continue to operate when the pin race is worn ¼ in.

Three different wear processes may take place in rock-bit roller bearings.

Abrasion . . . When bits are run under lightweight conditions with highly abrasive mud, the bearings are likely to wear as a result of abrasion. The worn surfaces are smooth and may have a dull appearance somewhat like a sandblasted surface. Wear results from the cutting action of sharp abrasive particles and progresses at a relatively constant rate.

Spalling . . . The wear process most frequently observed is spalling. This process is likely to occur whenever aqueous drilling fluids are used, including abrasive fluids if bit weight is not too low. Relatively large pieces of metal are broken loose from the race surface. Spalled areas appear on the race surface, and they enlarge until the original surface is all gone. Fig. 2. Spalling results from a fatigue mechanism; damage occurs after repeated applications of load, with complete failure following rapidly after the first signs of failure appear.

Spalling generally results from cracks that originate below the surface of the roller race. A network of subsurface cracks is shown in Fig. 3. Cracks have been found underneath race surfaces that were free from cracks or other visible damage. The difficulty in finding cracks below damage-free surfaces suggests that the cracks propagate rapidly and reach the race surface after they are formed.

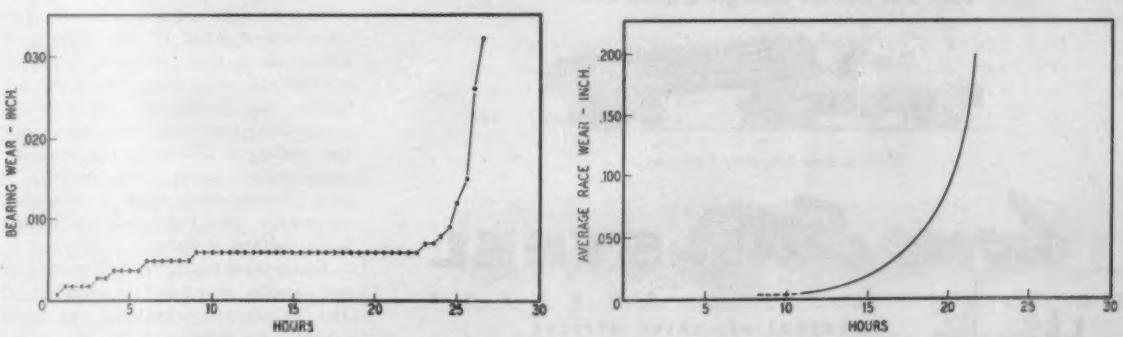
Fig. 4 shows bearing-wear curves. The rapid breakdown that occurs after the roller race has completely spalled makes accurate predictions of bearing life of successive bits practically impossible.

Scaling . . . When bits drill with dry air or natural gas, the bearings are likely to wear as a result of scaling. The worn surfaces have a smooth and slightly burnished appearance. When the surface is examined on a microscope, very thin scales can be seen. Scaling seems to be a result of heat. When bearings are assembled without lubricant and are run without any circulating fluid or coolant, the race wears as a result of scaling, just like that which occurs when bearings are cooled with forced air.

Testing Roller Bearings

Individual rollers in rock-bit bearings usually perform satisfactorily. When a roller bearing is wearing out, the rollers continue to operate in spite of the abnormally high stresses that are developed in them by the tilting of the cone and by uneven contact with the rough spalled race. There are times, however, when rollers in bit bearings break severely, but when they do, the roller race is usually worn out. Fig. 5.

In 1940 a bearing-test machine was built to assist investigations of rock-bit bearing performance. The machine was constructed to test a bearing having the same design and metallurgy as the roller bearing in a 5⅝-in. rock bit. Operating conditions were selected



TYPICAL ROLLER-BEARING BREAKDOWN, left, occurs when races spall in laboratory bearing-machine tests. The bearing is "worn out" when it is worn 0.030 in. Typical roller-bearing breakdown, right, is determined from laboratory tests with 7⅞-in. W7R bits run at 45,000-lb. weight and 60 r.p.m. Wear scale represents average wear of the three pin races in a bit. Bearings are "worn out" when average race wear is 0.100 in. Fig. 4.

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to simulate field conditions, as far as possible, and to duplicate the wear processes observed in field-run bit bearings. There were no problems in selecting test conditions; spalling, scaling, and abrasive wear were duplicated by selecting the right combinations of weight and environment.

Next, larger bearings . . . After the prototype had proved its value, additional machines were built for larger bearings. A present-day machine is shown in Fig. 6. The cone race (a) is held in the spindle (b) by means of a draw collet. The spindle is rotated at any desired speed by changing sprockets (c) or by changing the electric motor (d). The pin-race specimen slips into a hole in the pin-specimen holder (e) and is locked in place with set screws. The pin-specimen holder is supported on the far end by a trunnion (f). A latch arrangement allows the holder to slide axially for loading and unloading the test bearing and locks the holder against axial movement when the bearing is running. Load is applied to the pin-specimen holder through a rod connecting the yokes (g) and the hydraulic cylinder (h).

Mud is circulated through the bearing from a storage tank. The mud flows to the bearing through a hole in the pin specimen and returns to the tank through a trough. When fluid circulation is not wanted, a seal is used to hold the fluid in the bearing. When tests are run with air, an air-supply hose is attached to the pin-specimen holder in place of the mud-conducting hose; air is then forced through the bearing.

Measuring wear . . . When a bearing is tested, the cone race is rotated, load is applied to the stationary pin race, and the bearing is allowed to run continuously until it is worn out. Since very rapid wear occurs after the entire pressure area of the pin race has spalled, a bearing is declared worn out when it wears 0.030 in. The approximate wear in the bearing is shown on a dial indicator which is in contact with the pin-specimen holder; the reading on this indicator is recorded each half hour and when the reading is 0.030 in. the machine stops automatically. The bearing is then disassembled; wear is measured accurately, and the condition of the worn surface is noted.

For several years, bearing tests were run under standardized conditions. The standard bearing had the same design and metallurgy as the roller bearing in a 8¾-in. bit. Operating conditions were equivalent to 50,000-lb. weight on an 8¾-in. bit rotating

at 240 r.p.m. The circulating fluid was an aqueous bentonite mud.

Experience has shown that bearings run a certain number of revolutions regardless of rotary speed.

Most bearing tests were conducted to evaluate special design or metallurgical features. The performance of a special bearing was compared with the performance of the standard bearing. In order to make statistical comparison, 10 special bearings and 10 standard bearings were prepared. These were run alternately until all were tested, and then the difference in average bearing life was subjected to a statistical test for significance. The same general method was used when special environments were tested. Standard bearings were run with the standard and special environments, alternately.

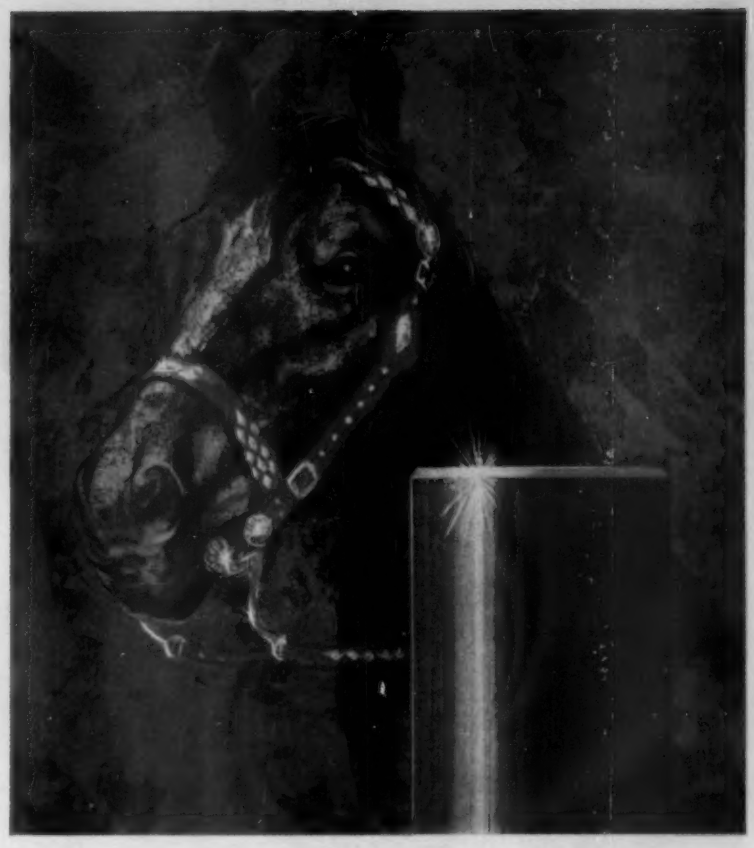
Comparing to field . . . When these early tests were made, the performance of the bearings in laboratory tests was better than the performance of bearings in many field-run bits.

However, after several samples of mud from the field had been tested, it was apparent that the good performance of the laboratory-test bearings was attributable to the mud that was used. Test bearings ran only about half as long with the field muds as they did with the standard aqueous-bentonite mud. Since each of the field-mud samples had been obtained from locations where bearing trouble was experienced, it was decided in 1953 that a more destructive mud should be developed for laboratory tests to simulate conditions existing in the field where poor bearing performance occurred.

Effect of Mud Solids

One of the most obvious differences between the field muds and the laboratory mud was "solids content." The field muds contained as much as 30% by volume of noncolloidal suspended solids, while the laboratory mud contained virtually none. On the assumption, then, that suspended solids might contribute to the destructive qualities of a mud, tests were made to find out if the addition of solids to standard bentonite mud would make it more destructive.

Tests were made with a variety of materials including quartz, barite, limestone, granite, mica, and other pulverized rocks as well as several kinds of clay. Some of these materials affected bearing performance and others did not. When bearings were run under conditions equivalent to 50,000-lb. weight on a 7⅞-in. bit rotating at 60 r.p.m., bearing life was reduced from 31.1 hours to 13.1



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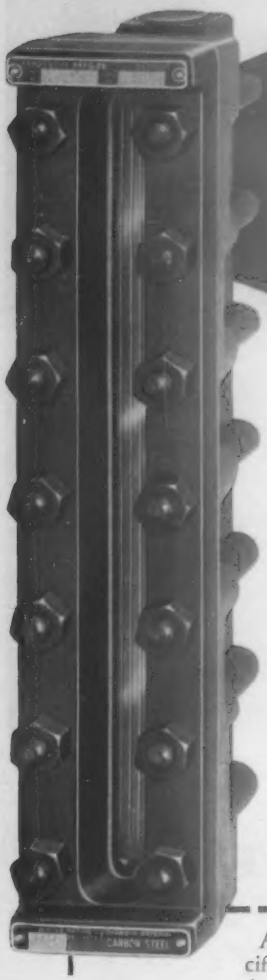

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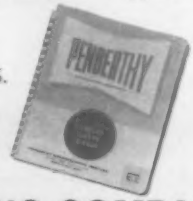

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hours after barite was added to the bentonite mud.

This barite mud was selected as a standard to represent field muds.

Effect of cuttings . . . The experience gained in developing a more destructive laboratory mud pointed out that the detrimental effect of field muds might possibly be attributed to the formation solids they contain.

Samples of mud and formation cuttings were obtained from wells where bearing performance was of interest. Bearing tests were made with the field mud and with laboratory bentonite mud to which pulverized cuttings were added. Bearings were run under conditions equivalent to those at the well when the samples of mud and cuttings were obtained.

After a number of samples had been tested, it was apparent that the destructiveness of the muds containing cuttings matched the destructiveness of the field muds surprisingly well.

Effect of particle size . . . While this work with field muds and cuttings was going on, attempts were being made to identify characteristics of muds that might account for their varying degrees of destructiveness. Chemical analyses were made to determine the percentages of common chemicals and minerals present. Physical properties such as density and viscosity were measured.

There was no correlation between bearing performance and these chemical and physical characteristics. However, observations indicated that particle size and abrasiveness of solids were related to their effect on bearing performance. For example, extremely fine materials such as lime, kaolin, plaster-of-paris, bentonite, and other processed clays were not as destructive as coarser materials such as granite, limestone, and basalt pulverized to —200 mesh.

Effect of Mud Chemicals

In October 1955 the effect of hydrogen sulfide was observed in laboratory tests for the first time. Bearings were run with a sample of Arbuckle production water from a location in Kansas where the use of this water in the circulation system was suspected of being the cause of poor bearing performance.

Effect of sour water . . . When the first test was run with sulfur water, every roller in the bearing broke. The second test bearing ran about twice as long as the first one and only one roller broke. Severe destructiveness was restored when a small

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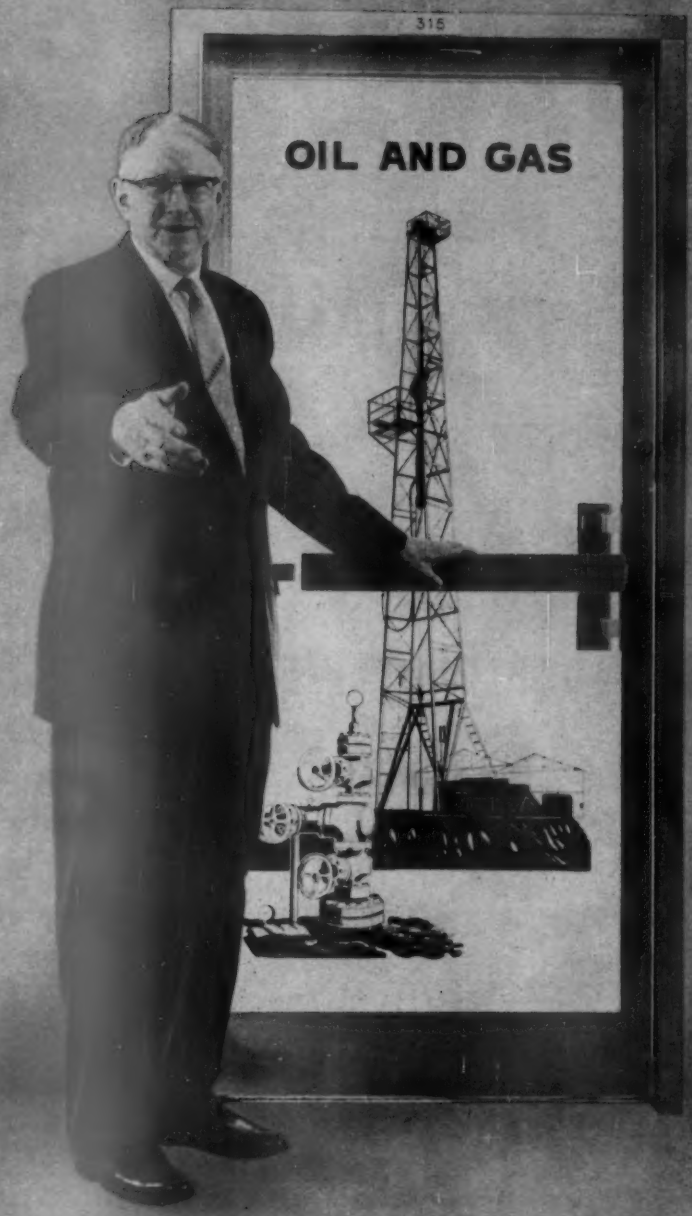

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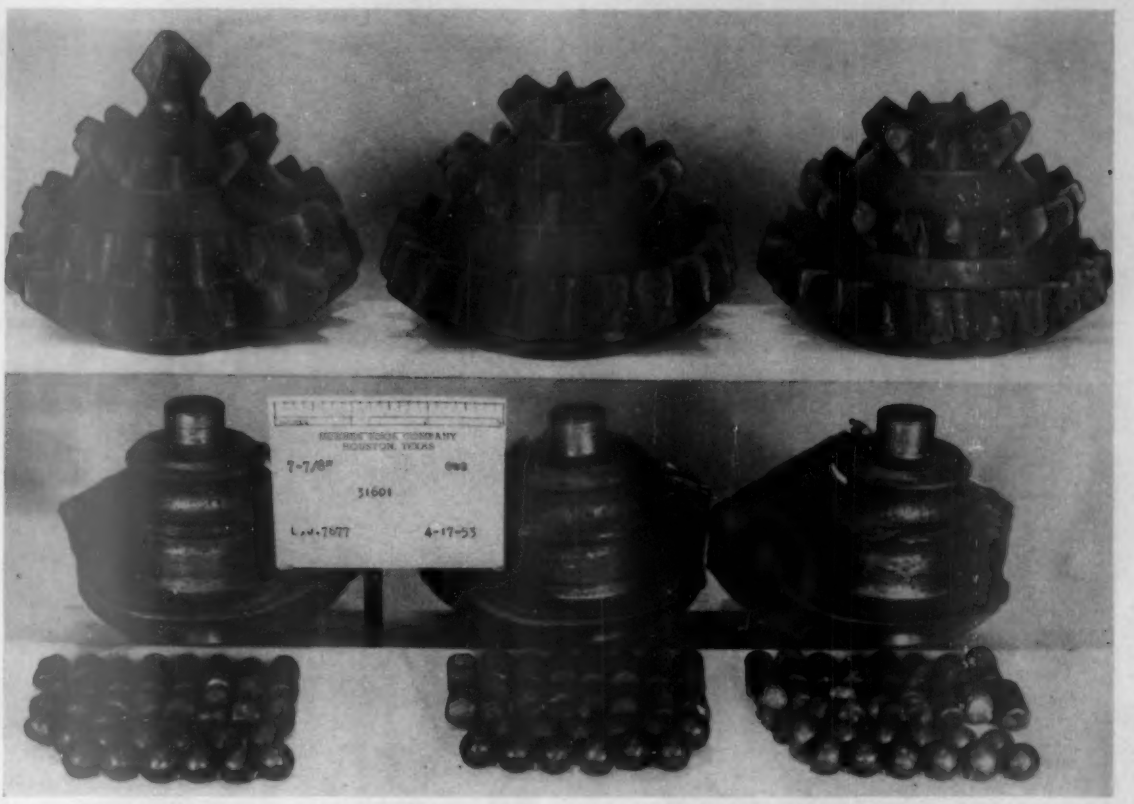


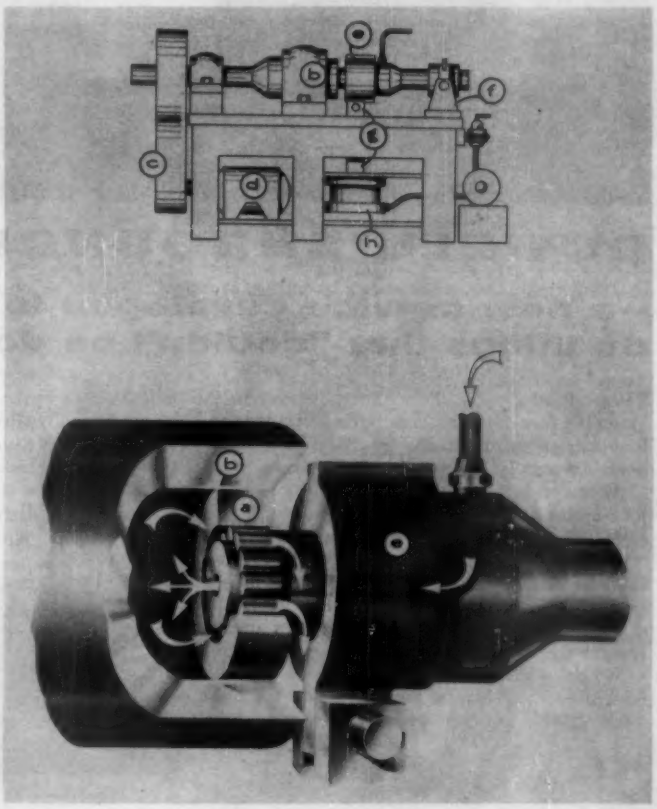
DISASSEMBLED ROCK BIT with severely worn pin races and broken rollers. This bit drilled 72 ft. in 4.7 hours with 30,000-lb. weight at 75 r.p.m. Fig. 5.

amount of ammonium sulfide was added to the water.

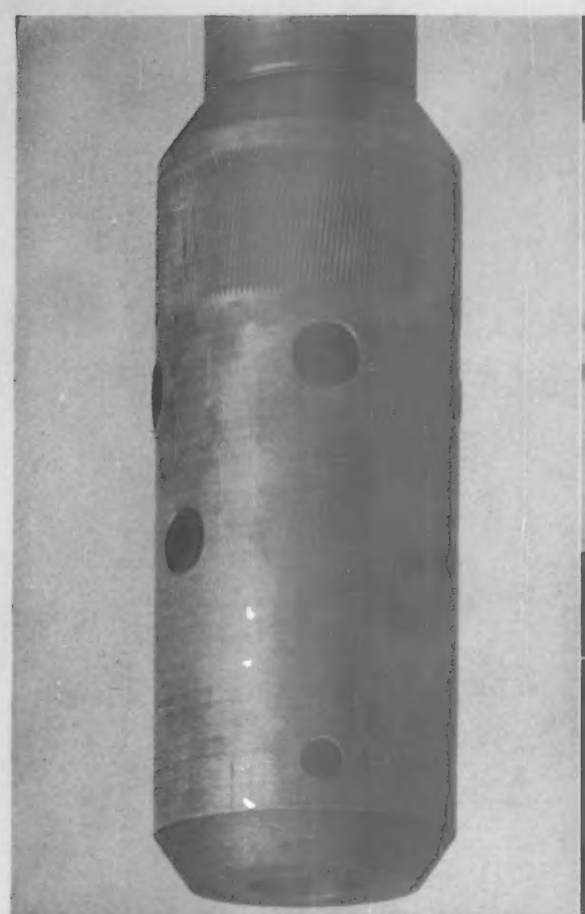
These initial tests were followed by extensive work to develop a sulfide-containing mud for use as a standard environment for laboratory tests. When sodium sulfide was added to some mud compositions, bearing life was not appreciably affected. Sufficient amounts of sodium sulfide could not be added to fresh-water bentonite muds without coagulating them.

When 0.1% sodium sulfide was added to a salt-water bentonite mud, average bearing life was 4.2 hours under conditions equivalent to 50,000-lb. weight on a 7⅞-in. bit rotating at 60 r.p.m. (Equivalent hours with standard bentonite and standard barite muds were 31.1 and 13.1, respectively.) This sulfide mud was selected as a standard representing field muds containing hydrogen sulfide.

The fact that the destructiveness of sulfide mud could be attributed to a specific chemical compound suggested that the detrimental effect of the mud might be alleviated by chemi-



TYPICAL MACHINE EVALUATES roller-bearing performances. During the test the cone race is rotated, load is applied to the stationary pin race, and the bearing is allowed to run continuously until it is worn out. Fig. 6.



Here is the single-stage tool used in Abrasijet. The special-alloy jet-nozzles may be used in combinations of from two to seven jets. There is also a multi-stage tool with jets in three horizontal planes. Sliding sleeves permit the opening of the jets in each plane as needed.

Four open jets are shown in this demonstration. Abrasive-laden fluid, blasting through these nozzles, can enlarge open holes, remove insoluble deposits, cut slots in formations, and perforate casing without explosives.

This photograph shows a 12-inch long limestone block that has been penetrated with Abrasijet. Notice the large diameter and smoothness of the hole which was made in less than eight minutes. In the same test, J-55 casing was perforated in 23 seconds.

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Abrasijet is used to remove scale from formation faces or casing. It is used to perforate casing. It is also used to enlarge open holes, and to create slots to reduce formation breakdown pressures in acidizing or fracturing treatments.

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cal treatment. Various chemical treatments were tried. Oxidizing, reducing, and precipitating agents and corrosion inhibitors were tested.

When it was determined that these methods were ineffective, various kinds of oils were added to the mud to form protective films on the bearing surfaces. Of all the treatments tested, the most generally effective one seemed to be the addition of heavy oil to the mud, but the improvement was not outstanding.

Sifting effects . . . More was learned about the effect of chemicals in mud from work that was prompted by results of tests made with a sample of mud from California in September 1956. The mud was from a well where 9⅞-in. bits were being pulled with worn-out bearings after drilling 6 to 7 hours with 20,000-lb. weight and 120 r.p.m. When test bearings were run under equivalent conditions with the field mud, bearing life ranged from 45 to 55 hours or about eight times as long as the bits ran. This was the first time that such poor correlation had been observed. When sulfide was added to the field-mud sample, bearing life was only slightly affected.

Since the field mud was corrosive (exposed surfaces of the test bearings were pitted), it was suggested that some chemical agent other than sulfide had made this mud destructive in the field, but the chemical was dissipated before bearing tests were run. With this thought in mind, an investigation was started to find out if chemicals that might be found in drilling muds have a detrimental effect on bearing performance.

Effect of salt . . . In the first test series, chemicals were added to a mud consisting of water, sodium chloride, and bentonite. This mud was used since the addition of one chemical, sodium sulfide, to it—making standard sulfide mud—greatly reduced bearing life from 53.4 hours to 9.0 hours when bearings were run under conditions equivalent to 30,000-lb. weight on a 7⅞-in. bit rotating at 60 r.p.m.

A total of 29 chemicals were tested in the salt-water mud. Common salts and mud-treating preparations were tested. Iodine and elemental sulfur were two of the most destructive materials. Some of the mud-treating chemicals such as starch, CMC, and the newer types of emulsifiers and surfactants had no appreciable effect.

The most interesting observation was that all eight of the lignin and tannin preparations tested were quite destructive; bearing life with these averaged about 20 hours as compared to 53.4 hours for tests with the standard salt-water mud.

Effect of thinners . . . Some of the tannin and lignin thinners were tested in other laboratory muds. Caustic-quebracho had no effect when added to standard barite mud, but when it was added to water containing low-yield clay, bearing life was reduced from 38 hours to 15 hours under conditions equivalent to 50,000-lb. weight on an 8¾-in. bit rotating at 60 r.p.m.

The next step in this phase of work was done to find out if chemical thinners might, at times, be the environmental factor that determined the life of bit bearings in the field. Tests were run with muds constructed in the laboratory from the same materials that went into specific muds in the field including formation cuttings. Bearings were run under conditions equivalent to those at the well where the cuttings were collected.

A series of tests were run starting with tap water, then with the tap water containing pulverized formation cuttings; then each chemical was added in sequence with bearing tests being run after each chemical was added.

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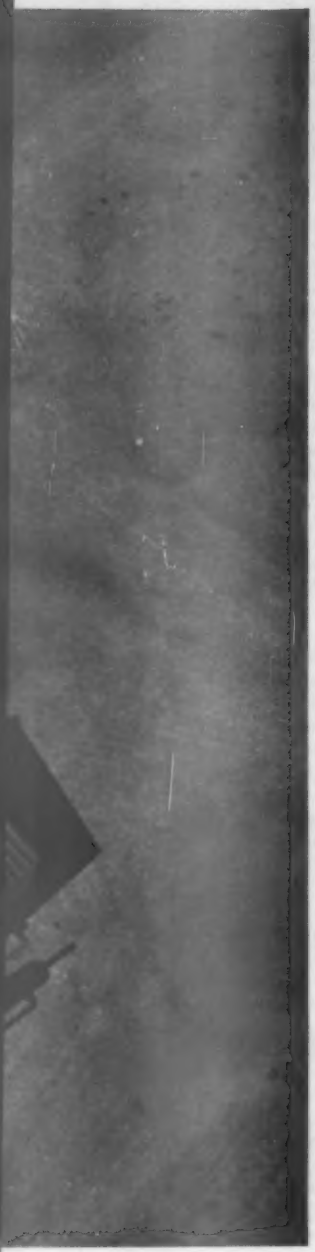

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tap water, add cuttings, add caustic and quebracho, add diesel fuel, add sodium sulfide. The addition of cuttings reduced bearing life from 36 hours to 26 hours; after the addition of thinner, bearing life was 12 hours, then after the addition of oil and sulfide, bearing life was 16 and 10 hours.

At the well where the formation cuttings and mud data were obtained, 9-in. OSC-1G bits were being pulled after 13 to 16 hours with worn-out bearings.

This series of tests indicated that the thinner contributed more to the destructiveness of the mud than did the cuttings; the oil was slightly beneficial and the mud in the field probably did not contain hydrogen sulfide. Tests of this kind have suggested that the destructiveness of any environment might be attributed mainly to the presence of one of the constituents.

The work done to reproduce environments encountered by rock-bit bearings, led to better understanding of the factors affecting bearing performance. Here are the general conclusions:

In an aqueous environment, the water itself has a specific effect. Roller races nearly always spall when water is present. Roller races scale when run with dry air; but when enough water is injected into the air stream to wet the race, it then spalls.

Aqueous environments containing hydrogen sulfide are the most destructive known. To some extent, steel adsorbs hydrogen from reaction with water, but the adsorption is aggravated by specific poisons such as hydrogen sulfide. Adsorbed hydrogen promotes subsurface cracks which result in spalling.

The detrimental effect of some suspended solids in muds can be attributed to small quantities of agents that promote the hydrogen reaction.

Certain kinds of suspended solids can be beneficial. For example, bearings run longer when bentonite or small quantities of barite are added to tap water. Although 10 to 15% by volume of barite is detrimental in aqueous environments, this amount of barite in diesel fuel resulted in an increase in bearing life from 13.4 to 71.0 hours, and barite in SAE 50 oil resulted in an increase in bearing life from 35.6 to 96.9 hours. The beneficial effect of barite in these cases might be due to its action as a coating agent to prevent metal-to-metal contact between the bearing components.

The beneficial effect of silica flour might be attributed to the fact that an abraded surface is not as receptive to hydrogen adsorption as a polished, cold-worked surface.

Further evidence of the detrimental effect of hydrogen was obtained in tests run in mineral acid solution having a pH of about 2 to 3, and with races charged with hydrogen by electrolysis.

No attempts were ever made to identify the specific poisons—other than hydrogen sulfide—since only trace amounts are necessary to produce a detrimental effect.

Effects of Speed, Weight

In the spring of 1958 a review was made of tests that had been run with the standard test bearing which represents the roller bearing in a 7⅞-in. W7R bit. There were more than 5,000 of these results available. Primary purpose of the review was to clarify the relative effects of weight, rotary speed, and environment on bearing performance.

Effect of rotary speed was studied first. Tests had been run at speeds ranging from 83 to 1,060 r.p.m. with various combinations of weight and environment. Rotary speed had no effect in terms of total revolutions. Bearing life was inversely proportional to rotary speed.

Plotting weight effect . . . The relative

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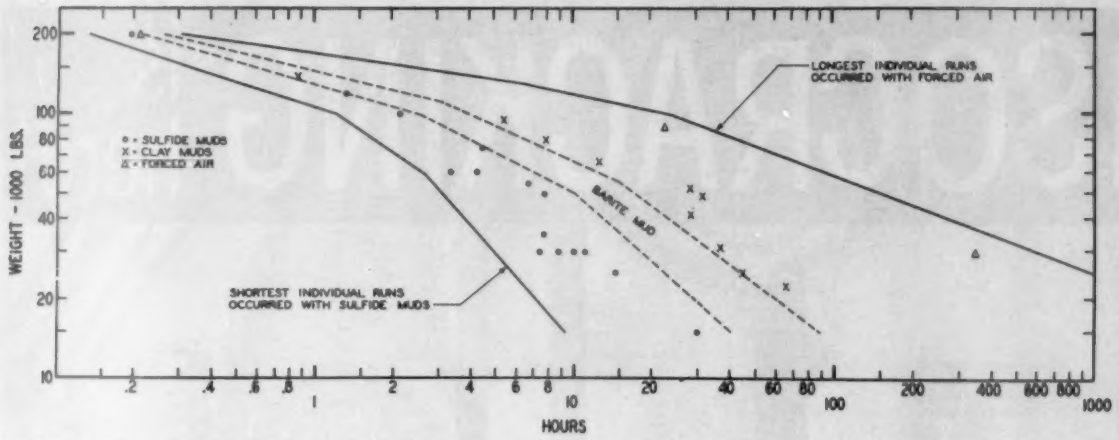

ROLLER-BEARING TEST RESULTS show effect of weight and environment on rock bit bearing performances. Data are for 7⅞-in. W7R bit rotated at 60 r.p.m. Fig. 7.

effects of weight and environment were studied next. More tests had been run with standard barite mud than with any other environment; therefore, these test results were selected for a statistical analysis to determine the effect of weight on bearing life.

A weight-life expectancy band was determined such that approximately 50% of the individual test values fell within the band with about 25% falling above it and 25% falling below it. This band was plotted within the broken lines shown in Fig. 7. It established the general characteristics of a weight-life curve and served as a reference when studying the effects of other environments.

After this life-expectancy band for barite was plotted on the chart, points were plotted on the same chart to represent the average bearing life that resulted in tests with two laboratory clay muds and three laboratory sulfide muds and with forced air. Then limiting lines were drawn representing the shortest and longest individual test runs that had ever occurred with the fluids.

Comparing to regular bits . . . The next step in this review was to test the accuracy of the life-expectancy band and the life-limit lines by comparing them with the life of bearings in regular production 7⅞-in. W7R rock bits which had been tested in the laboratory with the following circulating fluids:

"Sulfide mud": an aqueous fluid containing 6% sodium chloride, 10% bentonite and 0.1% sodium sulfide.

"Barite mud": an aqueous fluid containing approximately 17 lb./bbl. bentonite and 85 lb./bbl. barite.

"Lime mud": an aqueous fluid containing approximately 27 lb./bbl. calcium hydroxide and 47 lb./bbl. bentonite.

"Oil": a black journal lubricant having a Saybolt viscosity of 72 seconds at 210° F.

The full-size bits had been run at 60 r.p.m. under various weights. Each bit was run until the roller races had worn an average of 0.100-in. A typical wear curve for bit bearings has been shown in Fig. 4. The results of these tests are shown along with the limiting lines transferred from Fig. 7 in Fig. 8.

This report has pointed out that rock-bit bearing life is determined by weight, rotary speed, and environment. The effect of weight is different in different environments. For a given environment and for a limited range of weight, bearing life is inversely proportional to weight raised to a power which can be determined from the data presented in Fig. 7. Bearing life is inversely proportional to rotary speed; therefore, bearings run a certain number of revolutions regardless of rotary speed.

Two solutions . . . Study of Fig. 7 shows two points of particular interest concerning the effect of environment. When bits are running in an unfavorable environment and bearing life is short, a reduction of weight will not result in a substantial increase in bearing life; hence, an increase in weight to make the bit drill faster might be more economical than a reduction in weight to make the bearings last longer.

The second item of interest is the magnitude of the effect of environment on bearing life which points out how much bearing life could be increased if means were available to control the environment in which bearings operate.

Bit Design

Even in the early days of oil-well rotary drilling, the main trouble with rock-bit bearings resulted from the presence of drilling fluids in the bearings. In those days, friction bearings were used in rock bits. Lubrication was provided to minimize the effect of the drilling-mud environment. Rock bits were equipped with lubricant reservoirs, from which heavy oil was metered to the bit bearing. This arrangement was generally adequate in the original hard-formation bits because the shallow-toothed cutting structure wore out rather fast.

When the first deep-toothed cutting structures were put to use drilling softer formations, the bit did not dull as quickly. As a result, a bearing problem developed. With the bits running longer, there was more time for the bearing lubricant to become contaminated with abrasive solids.

Attempts were made to develop bearing seals to keep the drilling mud out of the bearings; but before an effective seal was developed, the problem was relieved in another way. A bearing structure was developed that functioned satisfactorily in the presence of drilling mud.

Antifriction Bearings

Rock-bit manufacturers introduced bits with antifriction bearings in the early 1930's. A structure, ideally suited to the space limitations of popular-size bits, was developed at that time. The new structure consisted of a highly effective combination of elements including large roller and ball bearings to carry the main radial and thrust loads, and a small friction bearing in the nose of the cone to help maintain alignment.

Problems developed . . . The perform-

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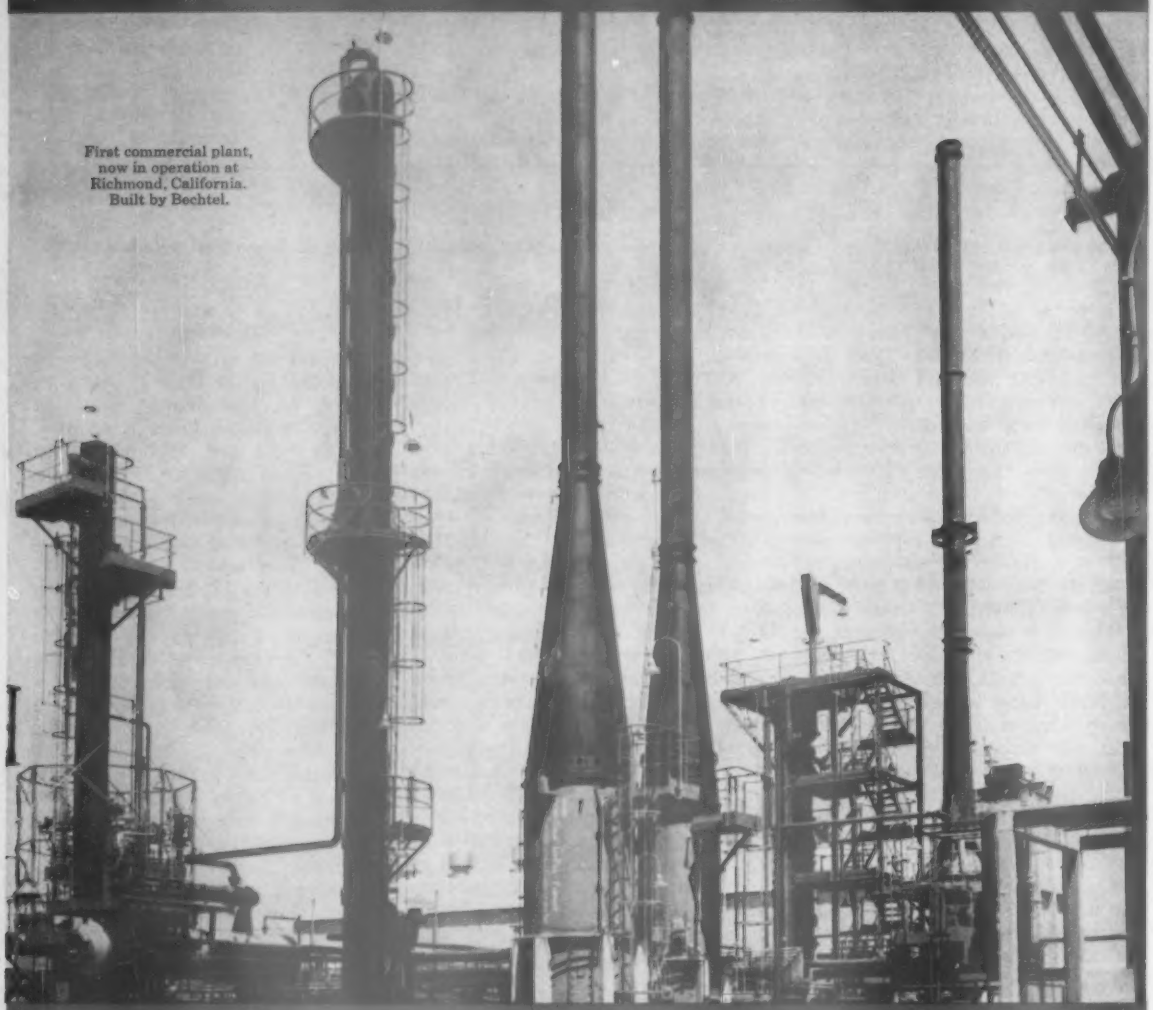

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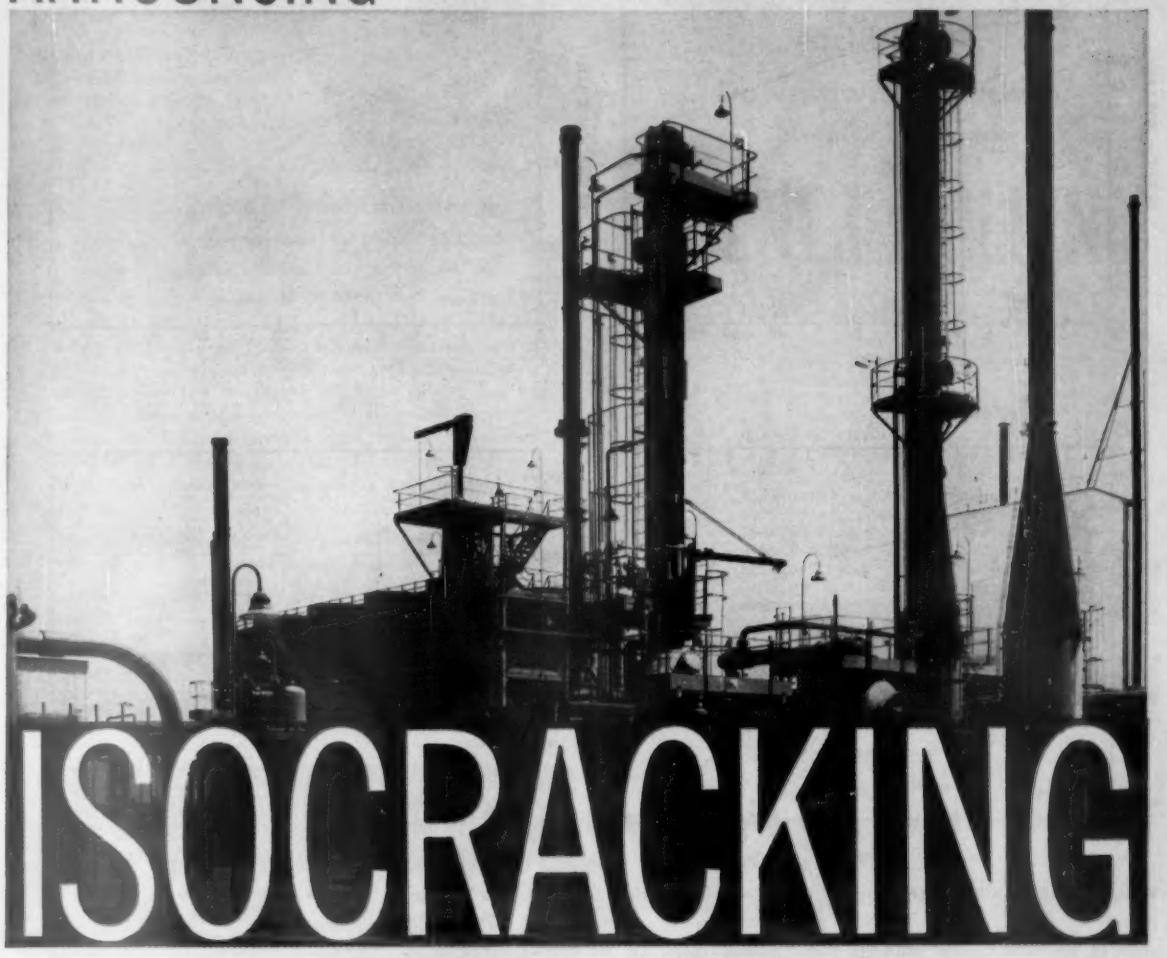

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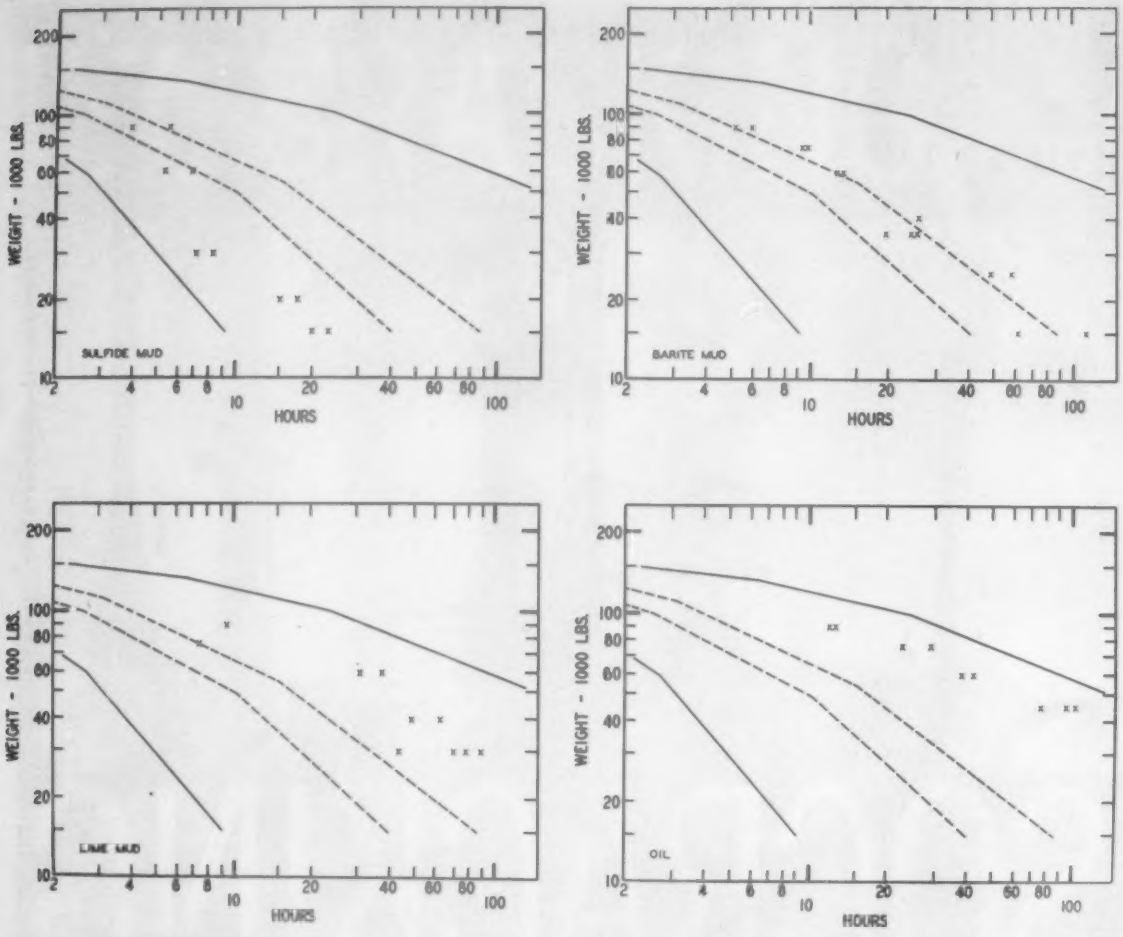

WEIGHT AND ENVIRONMENT greatly affect rock-bit-bearing life. Data are for 7⅞-in. W7R bit drilling at 60 r.p.m. Fig. 8.

ance of the antifriction bearings was generally satisfactory. Most of the new bits with deep-toothed cutting structures could be run until the teeth wore out. However, the antifriction bearing was not trouble-free. With increasing use of the new bearings, there were occasional instances of poor bearing performance.

Investigations were undertaken to find out if design or metallurgical variations from bit to bit were responsible for the instances of erratic bearing performance in the field. Hundreds of dull bits were returned from the field for laboratory examination. These extensive studies indicated that the wide variations in bearing life did not result from factors associated with design, metallurgy, or manufacturing processes.

Possible solutions . . . One investigation was based on the possibility that better bearing life might result if a new lubricant with greater resistance to the washing action of mud was developed. Several hundred greases were tested, many of which were special compositions submitted by manufacturers of lubricants who undertook extended projects to develop an improved grease. None of the trial greases stayed in bit bearings longer than the grease currently used.

Another project was based on the possibility that better bearing performance might result if seals were provided to keep the lubricant in the bearings. Laboratory tests were made with many types of commercially available grease seals and with specially designed seals. In field tests using these early designs, there were instances when grease residue was found in bearings after bits were pulled, but there was little evidence that bearing performance was improved.

Another project was based on the possibility that bearing performance might be improved if the bearings received lubricant continuously from a large reservoir. A lubricator sub was designed and built. The reservoir could maintain a continuous flow of lubrication to the bit bearings during most of the life of the bit. More than 100 bits were run in West Texas with the lubricator sub. The lubrication system functioned satisfactorily. Lubricant was found in the bearings of about half of the bits that were run with the sub; but the improvement in bearing performance that resulted was discouragingly small.

During these postwar years, improvements in rock-bit cutting structures and drilling techniques were resulting in better bit performance while placing greater demands on the bearings. The need for better bearings was emphasized to the extent that a trend started in bit design to reduce the space allotted to the cutting structure and to increase the space allotted to the bearings.

Recently, there have been important developments in the design and application of seals to rock-bit bearings. These new seals show promise of being able to control successfully the bearing environment throughout the bearing's life.

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At Fluor's Los Angeles headquarters, there is an 8,000-square-foot building where 30 plant designers work with 20 professional modelmakers. Drafting tables are within 10 feet of model assembly tables. Another building contains an elaborate photographic studio where precisely scaled isometric and plan views can be taken under shadowless lighting.

All this began seven years ago when Fluor engineers built a scale model and rigged miniature hoists to solve a difficult erection problem. Success of this trial led to experiments with the use of models as a basic design tool. Cost studies showed substantial savings in drafting man-hours (net savings, above modelmaking costs.)

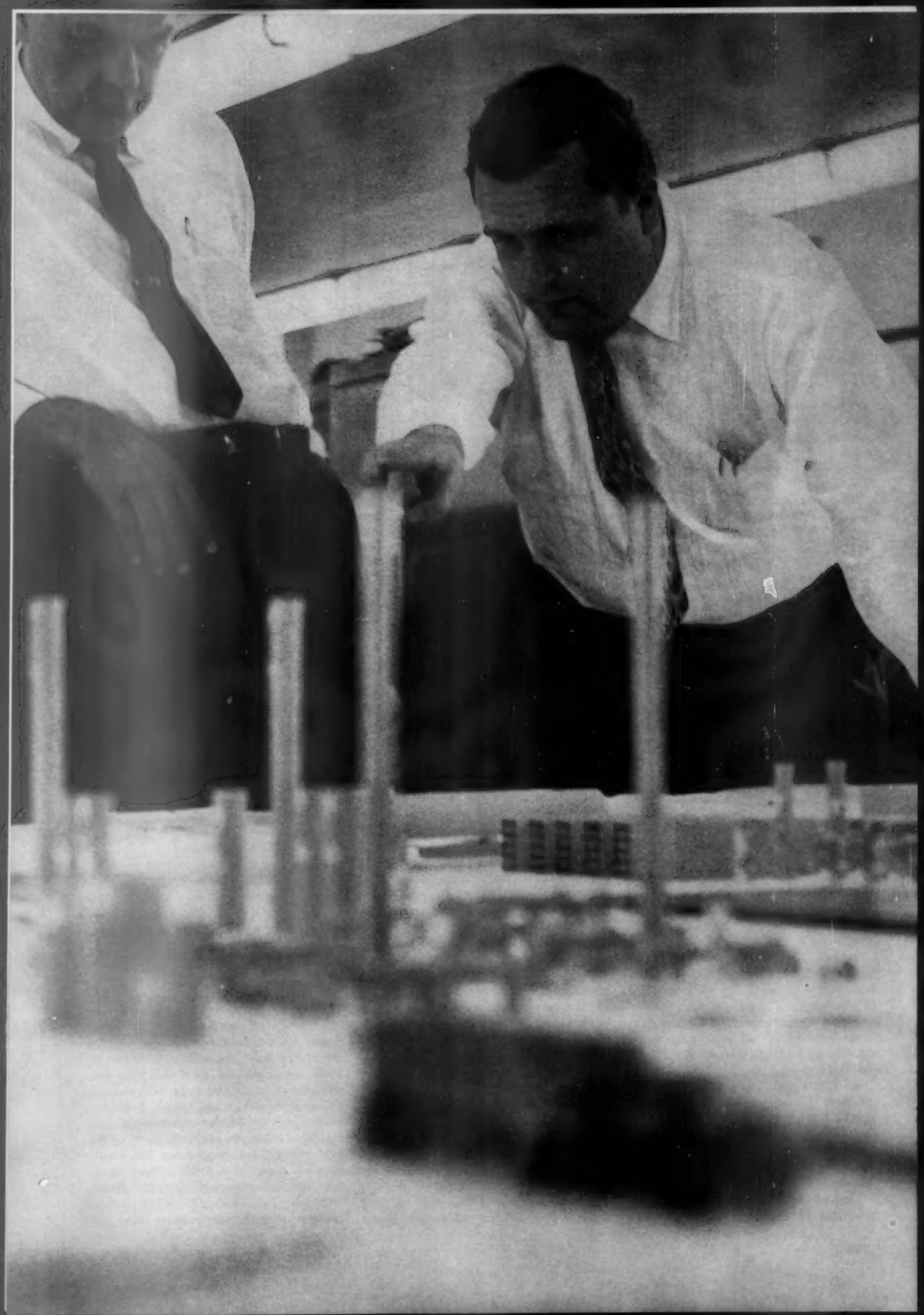
Today, models are to be found in most of Fluor's drafting rooms, and nearly all Fluor-built plants are designed with the aid of this tool. Beyond the dollar savings there are many less tangible benefits. Sizable groups can confer over a model, reach quick agreement on layouts, approve or revise many details at a single session.

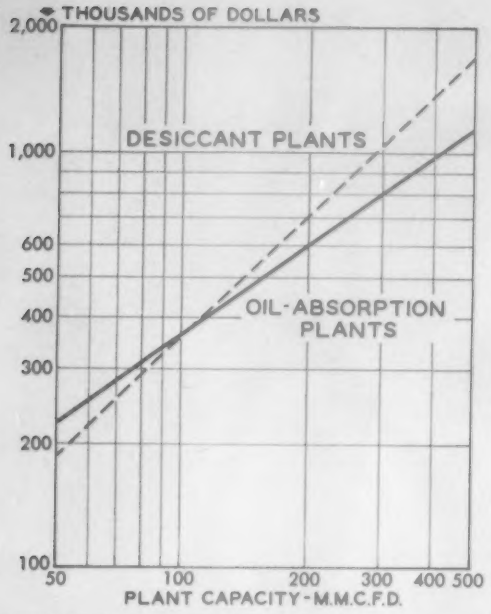
Piping runs are shorter and more direct, valves and instruments are more accessible when designers lay them out on a model (a Fluor comparison study of a refinery design showed a $50,000 saving in pipe, fittings and fabrication by use of a model vs. conventional layout drawings.)

Costly revisions are minimized when many specialists can study a complete plant in miniature before construction begins. In the field, models serve as a reference for construction crews and a guide for operator training.

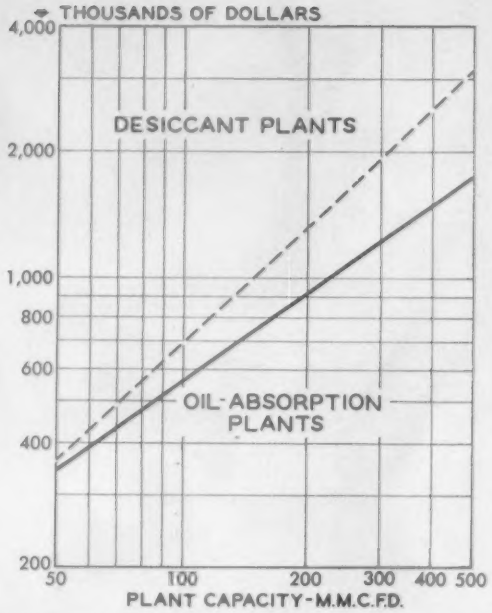
Unless scale models are properly used—as a basic, integrated design tool—most of these advantages are lost. The development and refinement by Fluor of design techniques using scale models has been a creative contribution to the engineering and construction industry.

For more information on the use of scale models in design and construction, write to Dept. 81, The Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, California.





ESTIMATING CONSTRUCTION COSTS for desiccant and oil-absorption gasoline plants operating on lean-gas stream. Fig. 1.



ESTIMATING CONSTRUCTION COSTS for desiccant and oil-absorption gasoline plants operating on rich-gas stream. Fig. 2.

How to select a gasoline-recovery plant

Oil absorption—or adsorption? Here are some facts and figures to guide you in your selection

ADSORPTION-TYPE gasoline plants are proving to be economical at gas throughputs much higher than operators originally thought they would. When both dehydration of a gas system and gasoline removal need to be carried out:

- Adsorption process applied on a lean-gas stream looks attractive up to 450 to 500 M.M.c.f.d. of gas throughput.
- For a rich-gas stream, upper limit of gas throughput for the adsorption process is 80 to 200 M.M.c.f.d.

When dehydration is not necessary:

- Adsorption on lean gas is attractive up to 50 to 110 M.M.c.f.d. of gas throughput.
- The upper limit for adsorption on rich gas seems to be about 50 M.M.c.f.d. of gas flow.

Operating conditions and other factors taken into account to arrive at these figures are outlined in other sections of the article.

One of the best and most profitable advances in the field of natural-gas processing which has occurred in the past few years is the use of adsorption (dry-desiccant) type gasoline plants. In general, these plants are small well or lease-size units. There is no reason, however, why such plants could not be built to process large volumes of gas.

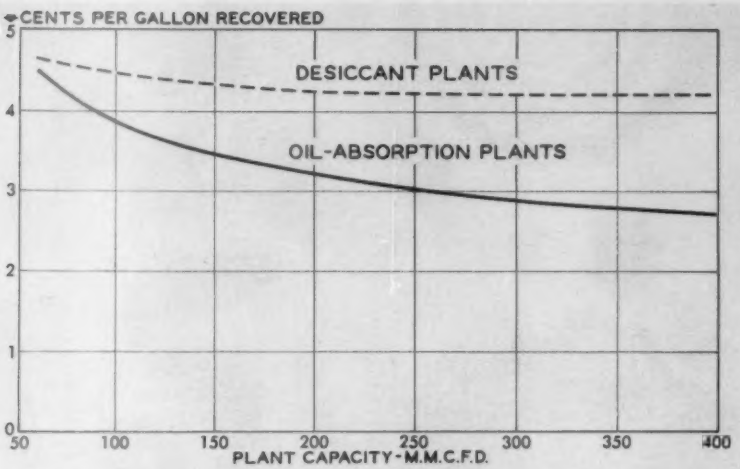
There has been, in fact, a trend in that direction. Several plants have been built, or will be built in the near future, with capacities in excess of 100 M.M.c.f.d. As the size of these plants becomes larger, they will begin to compete more directly with the conventional-type gasoline-recovery plants, such as oil absorption, low-temperature processing, or both.

If the gas stream is small, adsorption is the best type of plant. As the plant size becomes larger, oil absorption becomes more advantageous. In the middle, there is a range of flows in which the proper selection depends upon a good engineering evaluation of all the factors concerned.

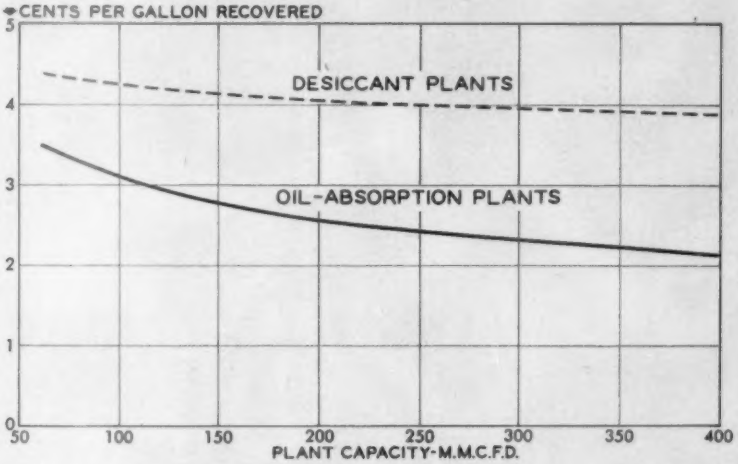
Ford, Bacon & Davis has made a series of studies to try to pin down

BY ROBERT F. McNAMARA

. . . chemical engineer with Ford, Bacon & Davis in New York. The author graduated from Polytechnic Institute in 1950. In 1952 he received masters' degrees in gas technology and chemical engineering from Illinois Institute of Technology. He has worked on design and economic problems relating to gas and light hydrocarbons for Ford, Bacon & Davis from 1952 to 1956, and for Arabian American Oil Co. from 1956 through 1958. He rejoined his present company early this year.



COSTS OF OPERATION for desiccant and oil-absorption plants operating on lean-gas stream. Fig. 3.



COSTS OF OPERATION for desiccant and oil-absorption plants operating on rich-gas stream. Fig. 4.

the particular conditions under which each of these plants can operate most advantageously. This article summarizes some of this work. Its purpose is to outline a method by which the problem can be solved and to give some generalized rules-of-thumb to help the lease operator or the pipeline company to select the best method of field processing.

Adsorption . . . There have been many excellent articles which describe both the methods and the equipment for recovering gasoline in a desiccant plant. In operation, these plants are similar to dehydration plants. A gasoline plant differs from a dehydration plant in that the operating cycle is reduced from 8 to 12 hours in a dehydration plant to 1 hour or less in a gasoline plant. During the adsorption process, both gasoline and water are adsorbed. Water, however, is adsorbed preferentially.

In a dehydration plant with a long cycle, the hydrocarbons which are initially adsorbed are gradually replaced by water vapor. If the cycle is shortened there is not sufficient time for the replacement of the adsorbed hydrocarbons by water vapor. As a result, it is possible to recover both water vapor and hydrocarbons during the reactivation part of the cycle.

By the addition of a single stabilizing tower, it is possible to recover a specification gasoline product. Plants of this type are simple; they have a minimum of rotating equipment. The maintenance costs are low. The plant can be easily adapted to unattended operation.

As in dehydration plants, a given volume of desiccant will recover a given volume of gasoline. As plant capacity (gasoline recovery) increases, the volume of desiccant required increases in almost direct proportion. For practical purposes, the maximum sized tower which can be used to contact the gas is limited to 6-8 ft.

Any plants which require more desiccant than can be stored in a tower of this size must be made up of parallel plants. Above a certain level, therefore, the costs tend to increase in direct proportion to the plant capacity.

Oil absorption . . . For many years oil absorption has been the work horse of the gasoline-recovery industry. The process is a continuous one. Gas and lean oil are contacted countercurrently in a tower or other contactor. The heavier components in the gas stream dissolve preferentially in the oil. These absorbed hydrocarbons are separated from the lean oil by fractionation at lowered pressures and higher temperatures.

Most plants are built to recover not only gasolines, but a considerable portion of the propanes and butanes as well. It is possible, however, to design a plant to recover only the gasolines. The elimination of LPG as a product simplifies the plant design. Low lean-oil rates are possible; liquid-handling equipment is minimized. Air-cooled exchangers can be used. The plant design becomes such that unattended operation is as practical as it is in desiccant-type plants.

Because of its nature, oil absorption is a typical fluid process. As a result, the capacity of a plant can easily be increased by enlarging the vessels, not by paralleling them. Since this is so, costs do not rise in direct proportion to capacity. If you double the capacity of an oil-absorption plant, for example, the costs of construction will not increase by a factor of 2.

Construction costs . . . These have been estimated for both types of plants. Two gas streams have been

TABLE 1—GAS ANALYSES USED

Component	Lean gas	Rich gas
Inerts	0.79	0.40
C_1	95.50	89.90
C_2	2.50	5.30
C_3	0.56	2.50
iC_4	0.15	0.58
nC_4	0.20	0.73
C_5	0.14	0.31
C_6	0.12	0.19
C_7	0.03	0.07
C_8+	0.01	0.02
Gasoline content (gal./M.M.c.f.)	120	235

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used to show their effect on cost. Both of these streams are shown on Table 1. The lean stream is typical of a dry high-pressure gas field. It contains about 120 gal. of gasoline per M.M.c.f. The rich stream contains about 200 gal. of gasoline per M.M.c.f. This analysis is typical of lower-pressure gas field or a mixed stream composed of high-pressure gases and some condensate field gases.

In all cases the plants are designed for a gas pressure of about 1,000 psig. Gasoline recovery is set at about 85% of the liquid content of the gas.

The costs are realistic erected costs of complete plants. They include the major plant equipment, and the material and labor to erect this equipment. To this, we have added an allowance for land, site improvements, product storage, plant offsite piping, utilities, and some additional instrumentation.

Costs for these plants are shown on Figs. 1 and 2. Fig. 1 shows the required investment for the lean stream described above for both absorption and adsorption plants. Fig. 2 shows the cost for the rich stream described above.

Operating costs . . . The cost of operating these plants has also been estimated. These costs include the direct operating costs (maintenance, labor and materials, administrative and general costs, fuel, and electric power), taxes, depreciation, and sufficient profit to enable the operator to recover his investment with a 10% profit over the life of the plant. These operating costs assume unattended operation of the plant. They do not include a deduction for the value of the liquid components if sold as a gas.

The direct operating costs for an oil-absorption plant are lower than for an adsorption plant. There are two reasons for this. Oil absorption requires smaller heaters in order to recover the hydrocarbons which have been removed from the gas stream. As a result, the fuel costs are lower. The desiccant in an adsorption plant must be replaced regularly. This results in an operating expense for materials which is greater than the cost of materials for an oil absorption plant.

The results are shown on Figs. 3 and 4. Fig. 3 shows the cost of plant operation (in cents per gallon of gasoline recovered) for both adsorption and absorption plants for the lean-gas stream. Fig. 4 shows the cost of operation using the rich-gas stream referred to above.

Dehydration effect . . . Oil absorption is simply a method of recovering gasoline. Adsorption plants will also dehydrate the gas as well as remove the gasolines. If the purpose of a plant is to remove gasoline alone, the cost data presented above provide a good basis for selection. If, however, the plant should dehydrate as well as remove gasoline, then comparisons based on the above figures are not applicable. It would be necessary to add dehydration plant to the cost of oil-

TABLE 2 — PLANT CAPACITY ABOVE WHICH OIL ABSORPTION BECOMES ECONOMICAL

	Flow (M.M.c.f.d.)	
	Based on investment only	Based on operating cost
Gasoline removal only:		
Lean-gas stream	110	50
Rich-gas stream	50	*50
Dehydration and gasoline removal:		
Lean-gas stream	500	450
Rich-gas stream	200	80

*The actual flow rate is less than 50 M.M.c.f.d.

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absorption plants in order to get comparative results.

This water problem is difficult to fix because it depends on the water content of the inlet gas and the required dew-point reduction. If these variables are known it would be possible to make a sound evaluation of the processes. Without such data it is only possible to guess at the construction and operating costs.

Based on work which Ford, Bacon & Davis has performed in the past, we believe that the incremental cost of adding a dehydration plant to an oil-absorption plant would be approximately $1,500 to $2,000 per M.M.c.f. per day of plant capacity. The operating costs associated with this dehydration plant would be about 1.5 to 2.5 mills per M.c.f. of gas processed. These costs can be added to the data on Figs. 1 through 4 to get a more valid comparison of the two processes when dehydration is an important factor.

Conclusions . . . Based on the ground rules and the data presented here, we can reach certain conclusions. These are summarized in Table 2. In this table the flow rates at which the costs of adsorption and oil absorption are equal have been tabulated. At flows above those shown, oil absorption should be used. At flows less than those shown, adsorption makes the most sense. Since some people prefer to make a selection based on minimum investment and others on the basis of minimum operating cost, both values are shown.

If a plant is to be constructed to get the biggest profit from the operation of a gasoline plant, the oil absorption is the best way to do it if the gas available is greater than 50 to 100 M.M.c.f. per day. The specific value depends on the gasoline content of the gas. The richer the gas, the more attractive oil absorption becomes.

If the operator must dehydrate the gas and he wants to recover gasolines as well, adsorption is usually the best way to do it. For gas streams as lean as 100 gal. per M.M.c.f., the gas stream would have to exceed 450 to 500 M.M.c.f. per day before oil absorption would be attractive. As the gasoline content of the gas stream increases, however, oil absorption looks more economical. If the gas stream is as rich as 200 gal. of gasoline per M.M.c.f., for example, oil absorption is the better process at flow rates as low as 80 M.M.c.f. per day if you are interested in minimum operating costs.

These conclusions are valid for the conditions assumed. In some cases Table 2 can be a distinct help in selecting a process because of a similarity of design conditions or because the flow rates are so far removed from the breakeven points listed in Table 2 that the answer is obvious. Where there is a doubt, however, a detailed study is justified. A lot of money is required to build one of these plants and the cost of a detailed study can easily be recovered many times over.

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BOOK

THE PERFORMANCE OF LUBRICATING OILS. By H. H. Zuidema. Published by Reinhold Publishing Corp., New York. 205 pp. $7.

A second edition of an ACS monograph published in 1951, this book summarizes and evaluates data on the performance characteristics of lubricating oils under various conditions. Multigrade motor oils, fretting wear, and paper chromatography are subjects new to this edition.

Other chapters include lubricating processes, rheology, oxidation, bearing corrosion, sludge and lacquer deposition, emulsification and foaming, and manufacturing methods. Newly published data is included in various additions and revisions in the text.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

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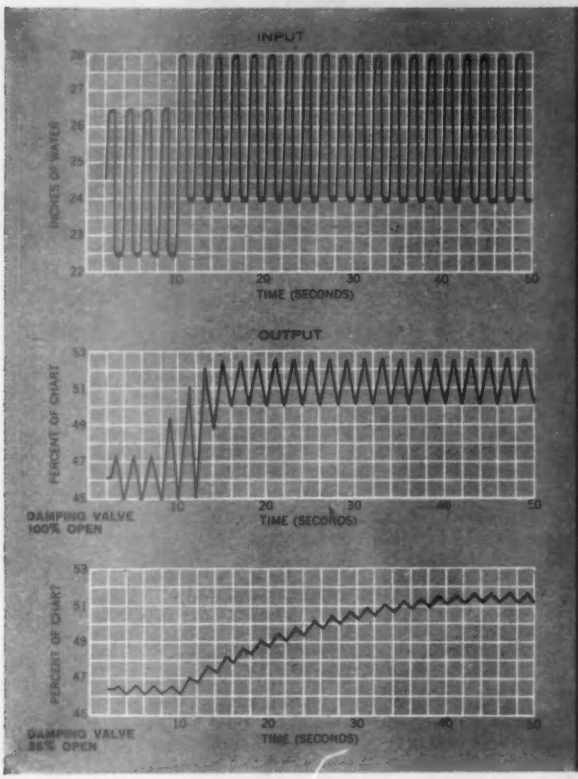

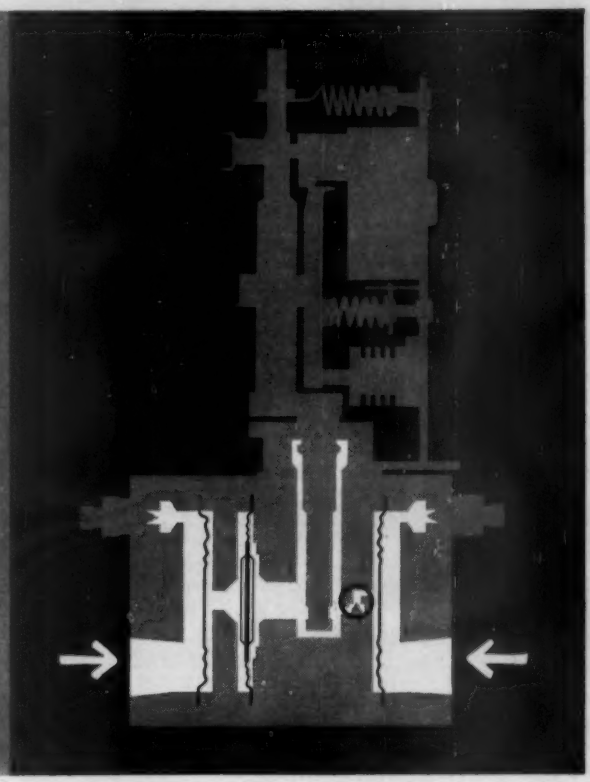

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On the Job

PIPELINING

Modernizing old horizontal compressor engines

A THREE-POINT modernization program is increasing the efficiency of the horizontal low-speed-type internal-combustion engines on the Cities Service Gas Co. pipeline system.

The program includes:

... A new ignition system.
... An improved oiling system.
... Improved bearings.

Other innovations will be tried out this year as steps to improve compressor-station operation still further with less attention and less expense. A semiautomatic loading system will be installed at one station and an automatic starting system will be installed at another horizontal engine station. The automatic starting system is probably the first in the industry for this type of engine.

A large percentage of the engines operated by Cities Service Gas' compressor-station department are of the horizontal low-speed type. The company has some such engines which were manufactured in the early 1900's and some of the same type which were manufactured as late as 1950. During this period there have been a number of engine design changes.

To render the dependable service to which gas customers are accustomed, it is necessary to maintain all engines in good operating condition. This is the reason for modernizing old engines as new materials and equipment become available and the need for specific changes is apparent.

New ignition system . . . The first step taken in modernizing the horizontal engines was to install low-tension magneto ignition systems, replacing the interrupter battery-type systems, which misfired and made it difficult to hold firing time.

The magnetos used in the new system are similar to those furnished on the new vertical or angle-type engines. The magneto is driven with timing belt and sprockets which drive it in perfect synchronism with the engines at four times the engine speed.

This new ignition system has been installed on Cooper-Bessemer Type 22 engines at Pampa, Higgins, Corwin, Wichita, and Grabham stations. In addition to having a more reliable ignition system, better fuel economy has resulted.

Lubrication system . . . The second step was to improve the oiling system.

The horizontal Type 26 Cooper-Bessemer engines installed at Hugoton and Greensburg stations are equipped with pressure-type oil filtering and lubrication systems which force oil under pressure to all important bearings. On the older horizontal engines, gravity-type filters were used which were very inefficient. The bearing lubrication was also gravity-fed.

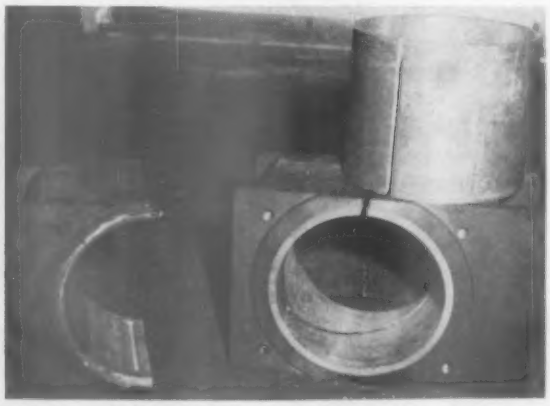
This system is being changed so that all of the oil is passed through a carton-type filter which removes dirt and foreign particles larger than small micron size. To pressure lubricate the important bearings, the oil, after passing through the filter, is piped to the cross-shaft back bearing. From the crank bearing, the oil is conducted to the main crosshead bearing through a tube attached to the connecting rod. Oil is also piped under pressure through the main bearing caps.

A study of the lubrication system indicated that the forced-feed lubricators for the cylinder oil were not operating efficiently, partly due to entrained air in the lubricating oil. When a high-viscosity fluid such as lubricating oil is pumped into a container and then poured into a lubricator, air bubbles are introduced which stop the oil flow. This trouble can be stopped by use of the pressurized lubricating system.

For several years Cities Service has been using the same oil for both the engine lubrication and cylinder

DISTRIBUTOR controls current from magneto in new ignition system for Cities Service horizontal engines.

PRESSURIZED OIL LINES carry lubricant through main bearing caps, replacing old gravity-fed system.



BABBITT BEARING (left) is being replaced by aluminum sleeve bearing (right); extra sleeve sits atop bearing shell.

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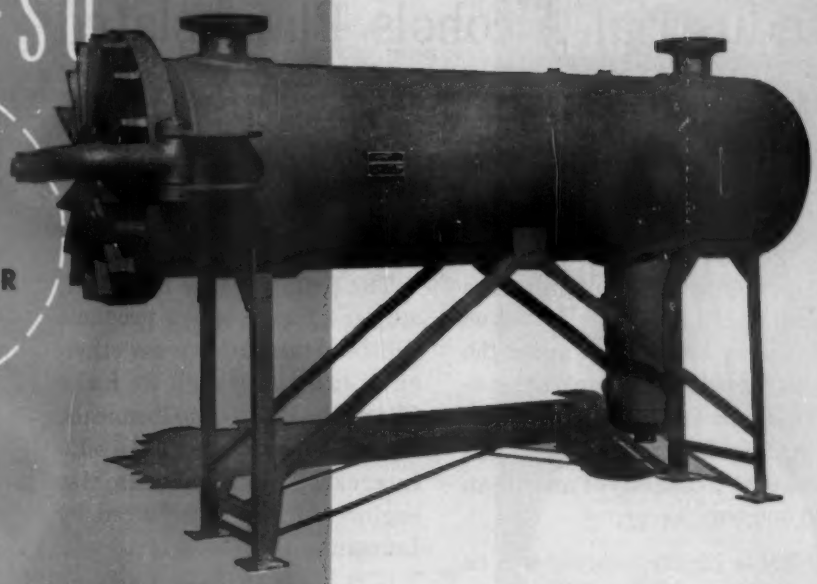

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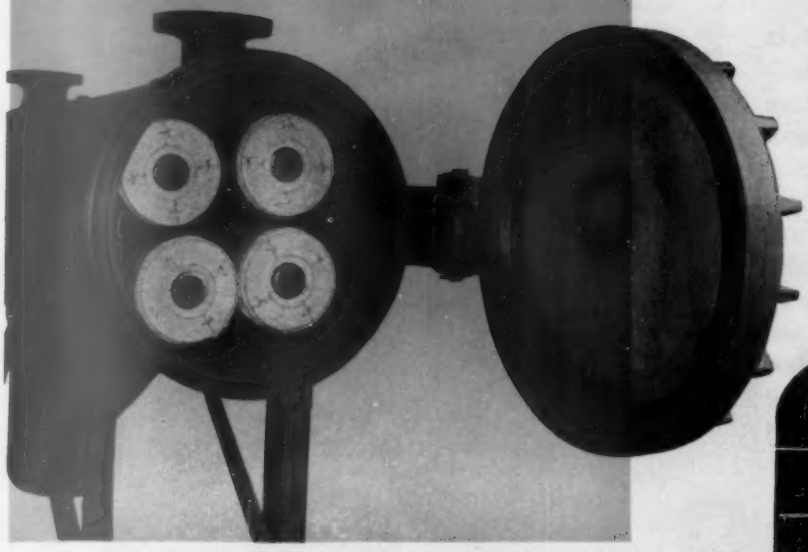

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Industrial Alcohols Plant slated for Continental Oil Company

ALFOL facility to be Constructed at Lake Charles, Louisiana, Will be Completed Early in 1961

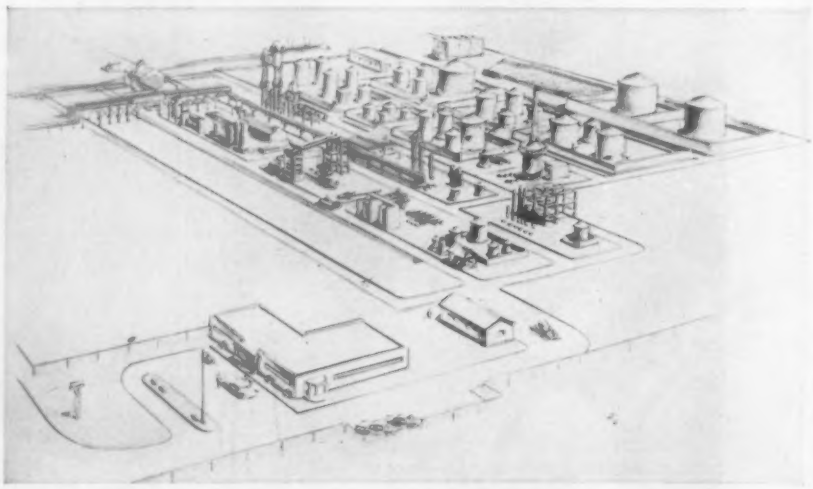
Continental Oil Company has announced that The Lummus Company has been awarded the contract to engineer and construct an Industrial Alcohols Plant at Lake Charles, Louisiana with a capacity of more than 50,000,000 lbs/yr.

These higher alcohols will be manufactured by a new technique originally conceived by Dr. Karl Ziegler. Organo-metallic catalysts are used to promote chain/growth of ethylene followed by oxidation and hydrolysis to primary straight-chain alcohols containing an even number of carbon atoms.

With completion of the plant these fatty alcohols will be available for the first time from petroleum rather than the natural sources such as tallow fat and coconut oil from which they are now produced. These primary alcohols to be marketed under the Conoco trade name of "ALFOL", will be used in the manufacture of detergents, plastics, cosmetics, lubricating oil additives, paper, textiles and emulsifiers.

The primary raw material, ethylene, for these new products will be obtained from the ethylene plant operated at Lake Charles by Petroleum Chemicals, Inc. of which Conoco owns a 50% interest. This plant was also engineered and constructed by Lummus.

In the past 50 years, Lummus has built over 800 plants to produce petrochemicals, chemicals and petroleum products. If your company is planning facilities of this kind, discuss your plans with Lummus.



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lubrication. With this in mind, a float-valve assembly from an automobile carburetor was installed on each lubricator to maintain a constant oil level and to permit a small amount of oil to be introduced continuously at the top of the lubricator. The oil used for the lubricators was taken from the engine-oil system through an auxiliary filter and a flowmeter which measures the oil in gallons and tenths of gallons. Copper tubing connects the outlets of the flowmeter to the various lubricators on the engine.

After installing this system on the cylinder lubricators, it was then necessary to provide a means of maintaining a constant supply of oil. To do this a float-valve assembly was placed in the settling tanks and oil was piped from the main lube-oil storage tanks with a meter placed in the line at each oil-settling tank to measure the amount of oil added to each engine. Experience had taught that under the gravity-type system it was necessary to drain and replace the engine oil periodically because there was a tendency for the oil to become acid and unsuitable for use. However, under the new system, it is not necessary to change oil in the crankcase as it is filtered continuously and new oil is added automatically.

Another improvement in lubrication is being tested at Drumright and Pampa stations. A pressurized greasing system which forces lubricating oil or grease to the wearing areas of the base plates and to the bearing points on the inlet-valve mechanisms has been installed on several engines. Cities Service Gas is now experimenting with a hand-operated pump on this system.

As air pressure is admitted to the pump, lubricant under high pressure is forced into the tubing leading to all the points on the pressure system. Each of the outlet connections is a tiny valve which can discharge a given amount of oil per cycle. Cities Service Gas hopes to install a pump which will be capable of lubricating all of the points on two engines and an electric timer which will make the system automatic throughout the engine room.

In addition to the changes in the lubricating system on the horizontal engines, the company plans to install this year automatic float valves on the lubricators and automatic liquid-level controls on the crankcases of all the angle-type engines on the system.

Bearing improvements . . . The third step in the modernization program was to improve the bearings on horizontal engines. The modern angle-type engine is now equipped with bimetal and trimetal bearings which have proved to be much superior to the old babbitt-type bearings.

For the older engines Cities Service Gas is now experimenting with bimetal and trimetal bearing surfaces. A trimetal bearing is being used for the crosshead pin: the bearing shell is made of cast steel or nodular or ductile iron; a bronze surface is bonded to the shell which, after machining, provides a foundation for the babbitt. The compressor department believes that these changes will increase the

PRESSURIZED GREASING system using tiny oil lines eliminates the need for the hand-operated grease gun.

It's New!
NOW—AT LAST A MEASURING WHEEL THAT MEASURES ACCURATELY TO A FRACTION OF AN INCH!

Rolatape's amazing new Model 415 meets all your measuring needs — measuring quickly and surely over the most uneven and irregular terrain with no risk of human error. This time-saving instrument is calibrated to measure accurately in full view of operator as it is rolled along, giving measurements in inches (to ½ inch) on one side of measuring wheel, and tenths of a foot (to .5 of a foot) on the other. Sturdy and lightweight, it is equipped with automatic brake and built-in stand. Handle folds compactly. See one at your dealer's today.

MEASURES ACCURATELY ON IRREGULAR SURFACES

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Santa Monica, Calif.
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CITY, STATE

Warren's High Pressure Screw Pump is proving its true economy with pumping efficiencies of 75% to 85% – on either high or relatively low viscosities

Warren #8CB Screw Pumps handling crude oil at a primary pumping station.

In crude line, product line and refinery jobs Warren High Pressure Screw Pumps —

- develop continuous flow
- can be direct driven . . . speed reduction gears are not necessary
- maintain constant capacity and pressure, even on oil containing foreign matter
- are suitable for unattended stations.

WRITE FOR SELECTION NOMOGRAPH #252

CENTRIFUGAL SCREW RECIPROCATING GEAR

WARREN PUMPS, INC.

WARREN, MASSACHUSETTS

8-1

On the Job

PIPELINING

life of the bearings on horizontal engines.

Automatic equipment . . . Cities Service Gas is also trying out other innovations which are new to its operations.

A semiautomatic loading system will be installed on the engines at Alva compressor station. This system will permit the engineer to operate the intake, discharge, and bypass valves and load each engine from a control panel located adjacent to the starting stand. This system appears to have considerable merit and will provide better and more economical operation.

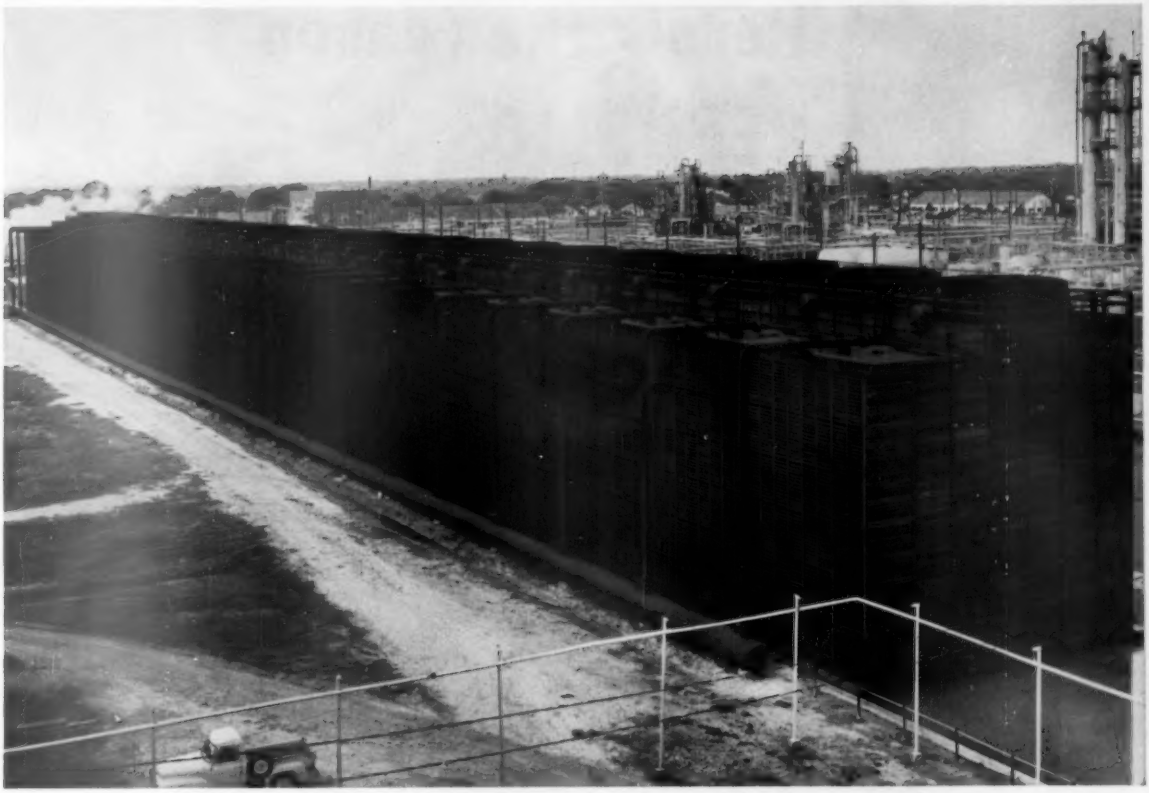
The company also will install on one of the Type 22 engines at Corwin station an automatic starting system which will permit the starting of an engine by simply pushing one button on the control panel. This system will permit the engineer to observe water temperatures at eight points on the engine, bearing temperatures on six different bearings, water pressure, oil pressure, starting-air pressure, fuel-gas pressure, and engine speed from the control panel.

Design of the automatic starting system has been completed and bids are being received for the necessary components. The cost of this installation and its benefits cannot be determined until some experience has been gained with it. The pilot operation at Corwin will determine its future application.

Cooling system . . . Improvements in the cooling-water system also have contributed to modernization at compressor stations.

When a change was made to closed water systems, using aerial-type cooling equipment, there was considerable fouling in tubes of aerial-type coolers. In order to eliminate fouling, the company revised the water-drainage system from the main engines principally on the piston-rod water drains. This eliminated any possibility of oil getting into the engine-water system.

A slip-tube system of draining rod water direct into the main engine-drainage system was installed rather than permit water to drain into the main frame and tail piece which have open vent areas permitting oil to get into the water system. This method was pioneered by Cities Service and has been used by other companies.



65,000 GALLON PER MINUTE HUDSON COOLING TOWER SUPPLIED IN EMERGENCY

Faced with shutdown of process units because of a damaged, partially inoperative cooling tower, a large Gulf Coast oil refiner called upon HUDSON for emergency supply of new cooling capacity. Despite necessity for modification of HUDSON standard design to conform to existing foundation, and though working under adverse condition of stepwise removal and replacement of partially operating old tower, more than 30 percent of the new HUDSON tower was operating in less than five weeks. The promised time schedule was met, the crisis averted, and guaranteed cooling performance exceeded.

Performance of such special services with speed, ability and integrity is a measure of the quality of HUDSON service — whether in repairing or replacing an operating cooling tower, or in designing and supplying a complete integrated system with balanced use of water and direct air for cooling all process streams.

In addition to water cooling towers, HUDSON designs and manufactures SOLO-AIRE units (for cooling solely with air), and COMBIN-AIRE units (for cooling with combination of maximum air and minimum water). Avail yourself of HUDSON's years of experience in integration of these all-encompassing categories of equipment into cooling systems utilizing optimum ratio of air and water balanced to best meet specific conditions of climate, process, and water availability and quality.

ONLY HUDSON OFFERS — — — —
process stream cooling systems integrating cooling towers, Solo-aires and Combin-aires for optimum balance of air and water cooling.

It will pay to consult Hudson during processing design stage of new projects.

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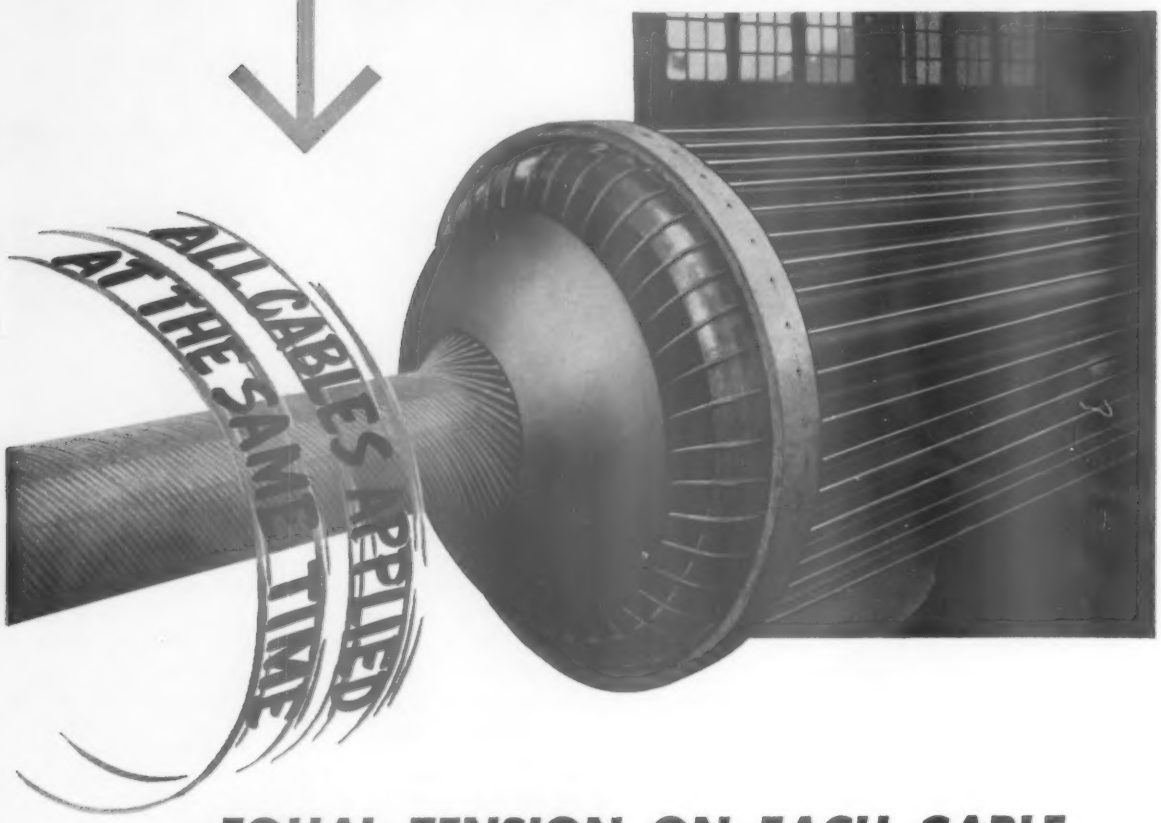
Here's the reason REPUBLIC ROTARY HOSE does not develop knots



EQUAL TENSION ON EACH CABLE

Only Republic Rubber can make Rotary Hose this way. The machine, shown here, applies all cable wires at the same time. It was designed and built in our own factory. These cables have the same tension so that pressure all along the hose will be equalized and knots or ridges cannot develop. The hose has the additional advantages of flexibility and crush resistance. Users have been generous in their praise for this hose as "the best Rotary Hose made". Stocked by J & L Supply Stores.

SUPPLY STORES STOCK THIS AND OTHER REPUBLIC HOSE

REPUBLIC RUBBER DIVISION

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NOW WORKING TOGETHER
TO SERVE YOU BETTER...

A most logical combination

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Yuba–with five plants manufacturing heat transfer equipment–has added to its organization the internationally preferred producer of heaters for the process industries...Petrochem Development Company, Inc.

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Established product or new development...Petrochem IsoFlow Furnace or advanced-design air-cooled heat exchangers... Yuba can best supply your needs.

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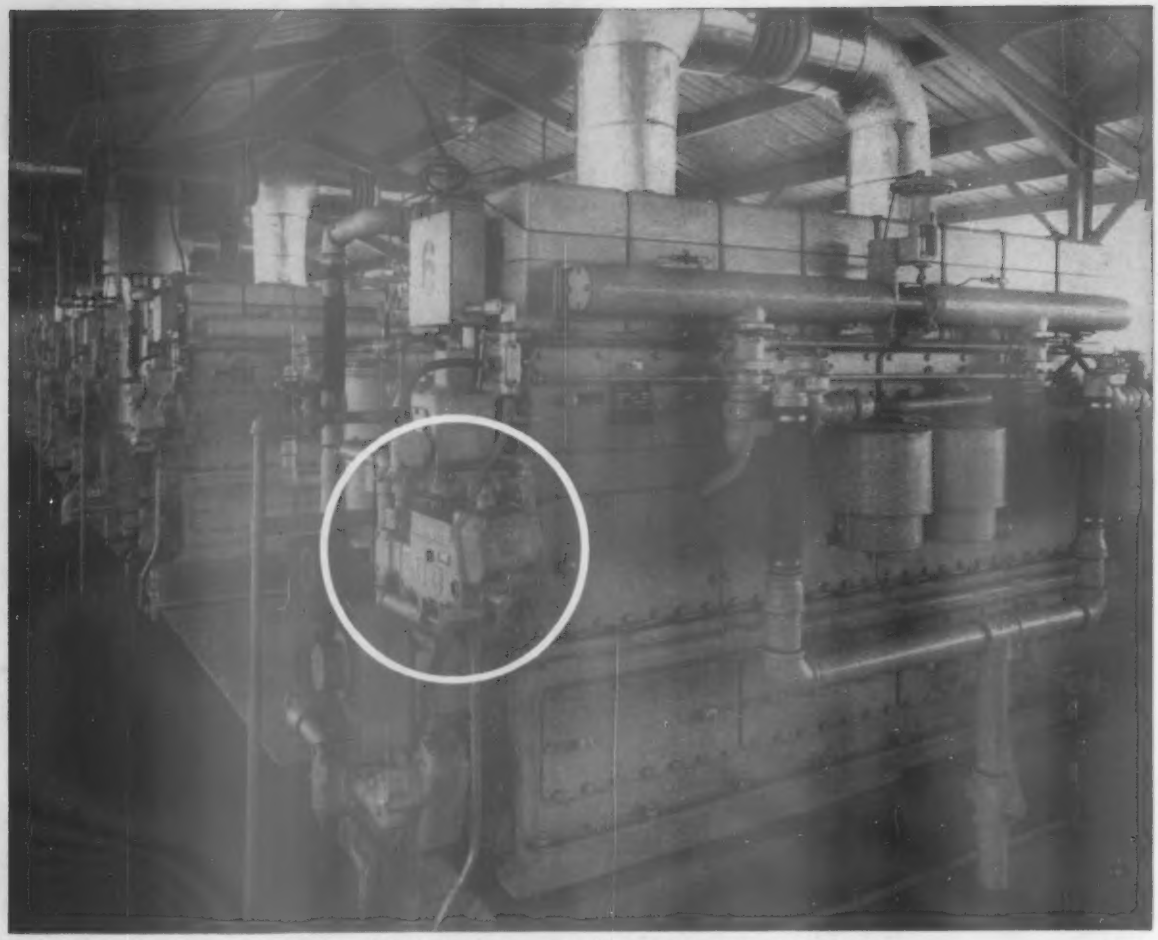

Circle indicates Bendix LC magneto on White Superior engine at Long Beach.

BENDIX LC MAGNETOS HELP POWER GIANT LONG BEACH WATER-FLOODING PLANT

Long Beach, California, operates what may become the world's largest water-flooding plant—drawing water from the Pacific Ocean and pumping it into the Wilmington Tract beneath the city. The additional pressure created will aid in oil recovery and, it is hoped, will reduce land subsidence in the area.

Currently operating at a rate of 120,000 barrels per day, the capacity will be increased and may eventually reach 1,000,000 barrels per day—which would make it the world's largest project of its kind.

The plant is powered by eight White Superior gas engines equipped with Bendix* LC magnetos and HI-V transformer coils. These matched ignition systems, noted for long service life, simplified maintenance at low cost and complete operating reliability, can be used with engines of from six to sixteen cylinders.

If you want to know why major operators are specifying Bendix LC Ignition, write SCINTILLA DIVISION, BENDIX AVIATION CORPORATION, SIDNEY, NEW YORK.

*REG. U.S. PAT. OFF.

MATCHED IGNITION SYSTEM

Export Sales and Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y. *Canadian Affiliate:* Aviation Electric Ltd., 200 Laurentien Blvd., Montreal 9, Quebec. *Factory Branch Offices:* Burbank, Cal.; Orlando, Fla.; Chicago, Ill.; Teaneck, N. J.; Dallas, Tex.; Seattle, Washington; Washington, D. C.

Scintilla Division
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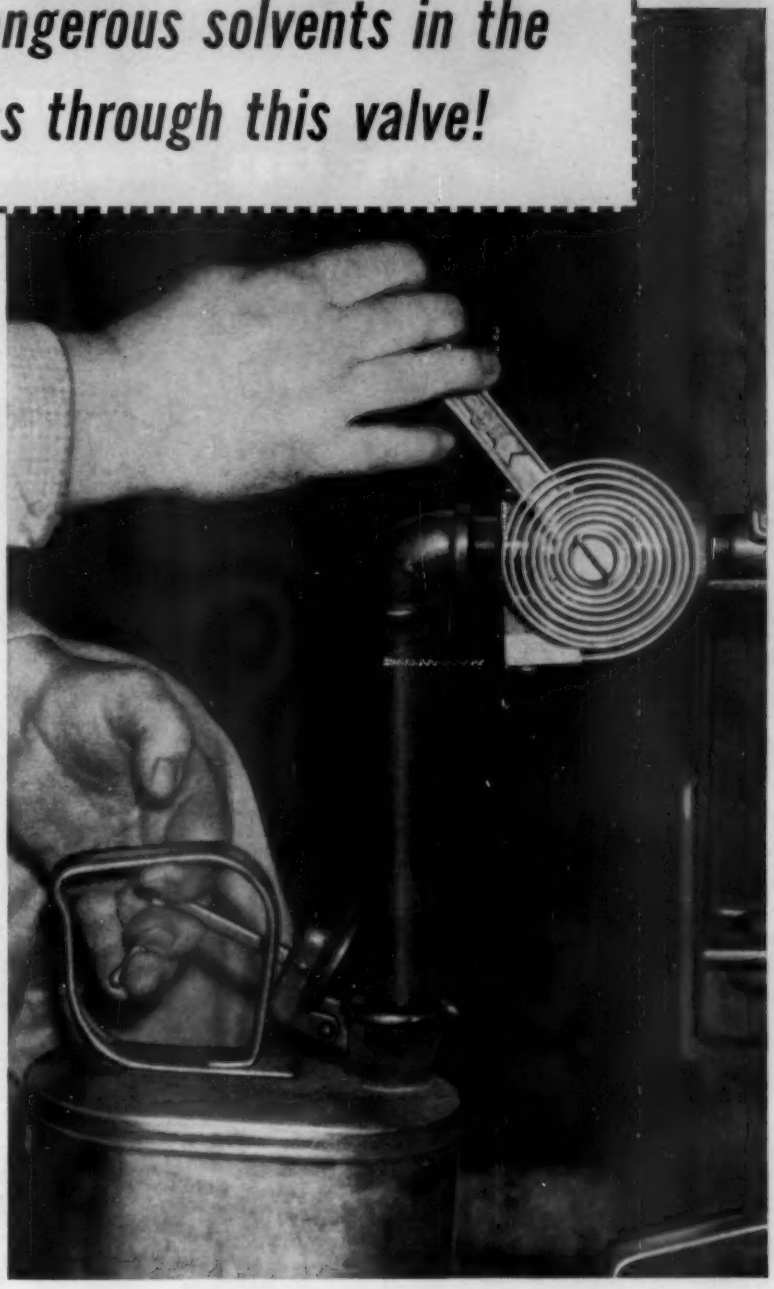
Bendix
AVIATION CORPORATION

The most dangerous solvents in the world pass through this valve!



But it's a *safe* passage. The ROCKWOOD ¾" (Fig. 802) Self-Closing Ball Valve is designed for *smooth, leakproof* handling of highly flammable liquids. A Rockwood Exclusive!

Take a typical installation at an experimental station of one of the nation's largest chemical companies. Here 36 different solvents, ranging from acetone to xylene, are dispensed from bulk containers. All types of self-closing valves were tried and evaluated for this critical job. None equalled ROCKWOOD for positive performance.

Unique ROCKWOOD Full Round Flow design holds turbulence to an absolute minimum — keeps static at a low level. Flash potential is negligible, greatly reducing fire hazard. In addition, the exclusive "*Spring Pressure* Compensation" keeps ball and seat in snug contact — assures leakproof, dripless shut-off, compensates for wear. Bronze valve body and Teflon trim resist corrosion. After 11 months and 103,200 open-and-shut cycles the company reports: trouble-free operation since installation.

Be as safe and sure with your solvent handling. Send coupon for complete details on the ROCKWOOD Self-Closing Ball Valve. Tested and listed by Underwriters' Laboratories, Inc.

ROCKWOOD BALL VALVES

FULL, ROUND FLOW

Distributors in all principal industrial areas

ROCKWOOD SPRINKLER COMPANY
A Division of the Gamewell Company
245 Harlow Street, Worcester 5, Massachusetts

Please send me complete details on the ROCKWOOD ¾" (Fig. 802) Self-Closing Ball Valve.

Name .....
Title .....
Company .....
Street .....
City ..... *Zone* ..... *State* .....

Let your plans include the specialized knowledge and resources of the nation's Pioneer Oil Bank.

84th Year of Dependable Service

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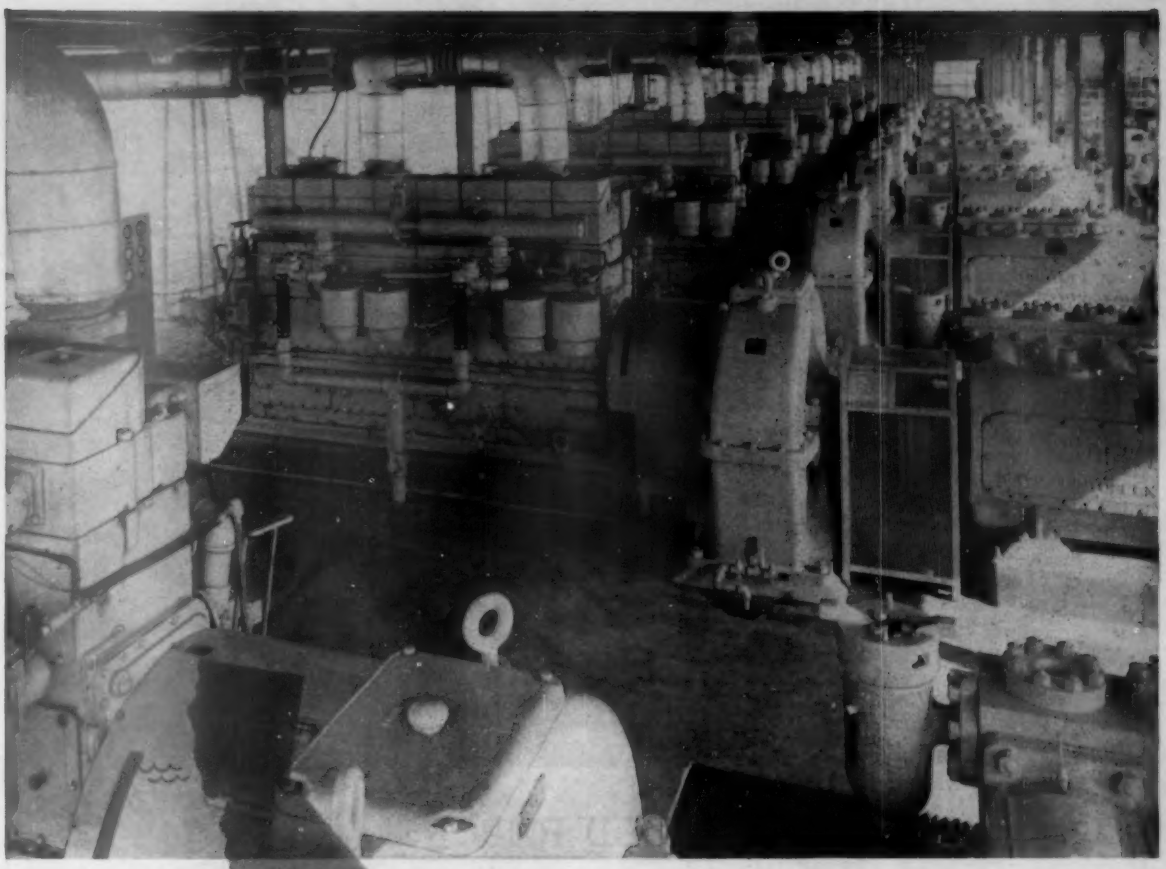
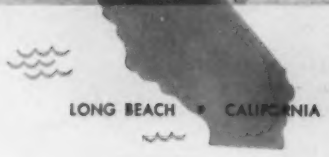




Superior engines power the pumps for world's largest waterflood!

At City of Long Beach's busy waterflooding plant on City Pier "A," 8 White Superior gas engines drive pumps that suck 120,000 barrels per day from the Pacific and inject it into Wilmington tract beneath the city. This waterflooding project, which may eventually reach 1,000,000 bpd to become the world's largest, provides additional pressure for secondary oil recovery, and may possibly arrest or ameliorate land subsidence in the port area.

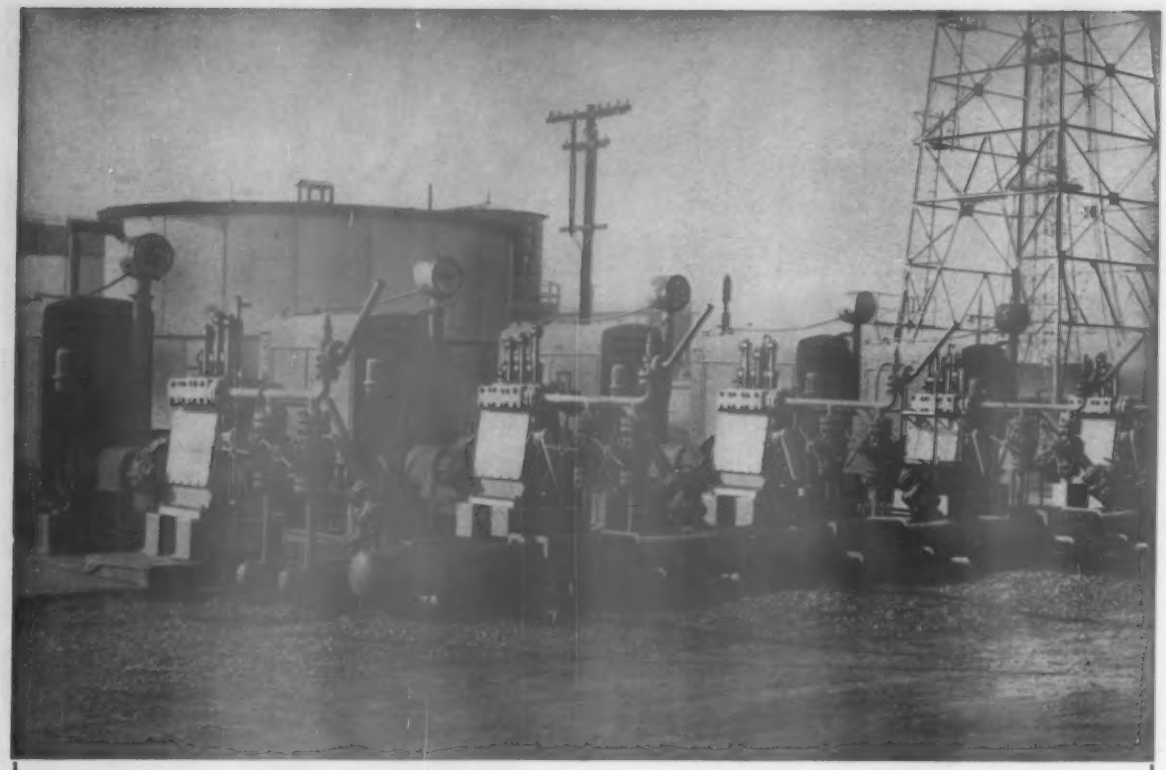
Dependable Superior engines are a wise choice for this open air, round-the-clock, long range pumping duty. Each Superior Model 8G-825 at Long Beach is rated 500 HP at 862 RPM to drive pumps through speed reducers. This true, conservative horsepower rating eliminates "straining" which shortens engine life. It also allows plenty of reserve power to meet extreme operating conditions. Superior's rugged open chamber combustion, precision construction and many new improvements combine to conserve fuel.

For every oil field job—waterflooding, drilling, production and pipe line pumping, repressuring, compressing or electric generation—specify Superior. Available in diesel, dual-fuel or gas engines from 190 to 2150 HP and in portable or stationary generator sets from 150 to 1500 KW. Get complete information from leading oil field distributors, White oil field representatives, or through . . .

Superior ENGINES ATLAS Imperial DIESEL ENGINES White DIESEL

White Diesel

WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
Plant and General Offices: Springfield, Ohio



FIELD REPORT

FLOOD: Hellman-Reyes
Dominguez First East Central

OPERATOR: Union Oil Company of California

PUMPS: Five Aldrich Triplex

FLOODING STARTED: July, 1954

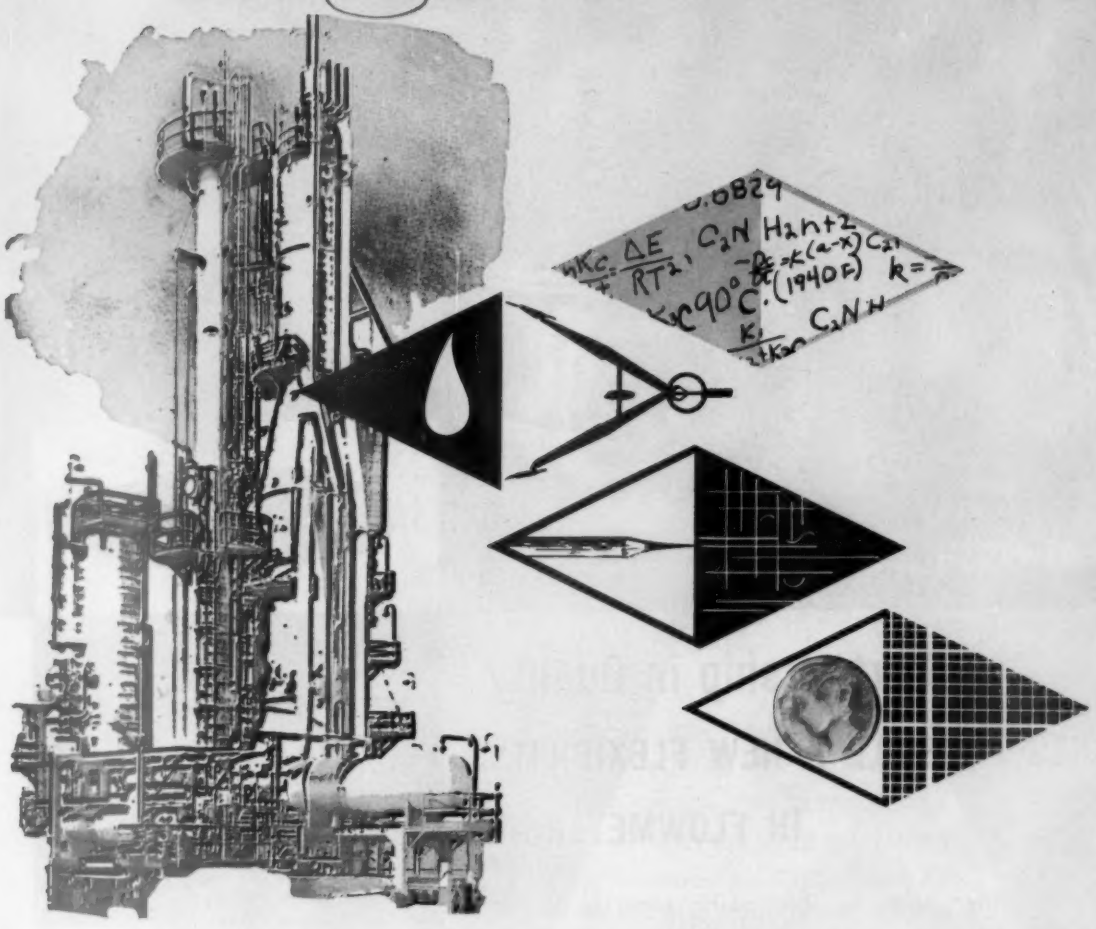
EXPERIENCE TO DATE:

Pumps are in continuous service, delivering 10,000 B/D at 1300 psi. Customer reports: "No mechanical breakdowns of any type on these pumps...plunger packing and valve discs replaced only once to date."

Field parts stock available in Carmi, Ill.; Casper, Wyo.; Charleston, W. Va.; Houston; Los Angeles; Odessa and Tulsa. For further information, write the Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.

the toughest pumping problems go to ALDRICH

intangibles were never so important



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Worker recruiting and training . . . special safety programs . . . on-the-spot solutions to pressing problems . . . these and other extras are included in Procon service. Applying such intangibles to construction of petroleum, chemical and petrochemical plants is the specialized function of Procon. Modern, efficient construction techniques form but a part of the precision construction system developed by Procon. That is why a Procon-built plant can be depended upon to more than meet specifications.

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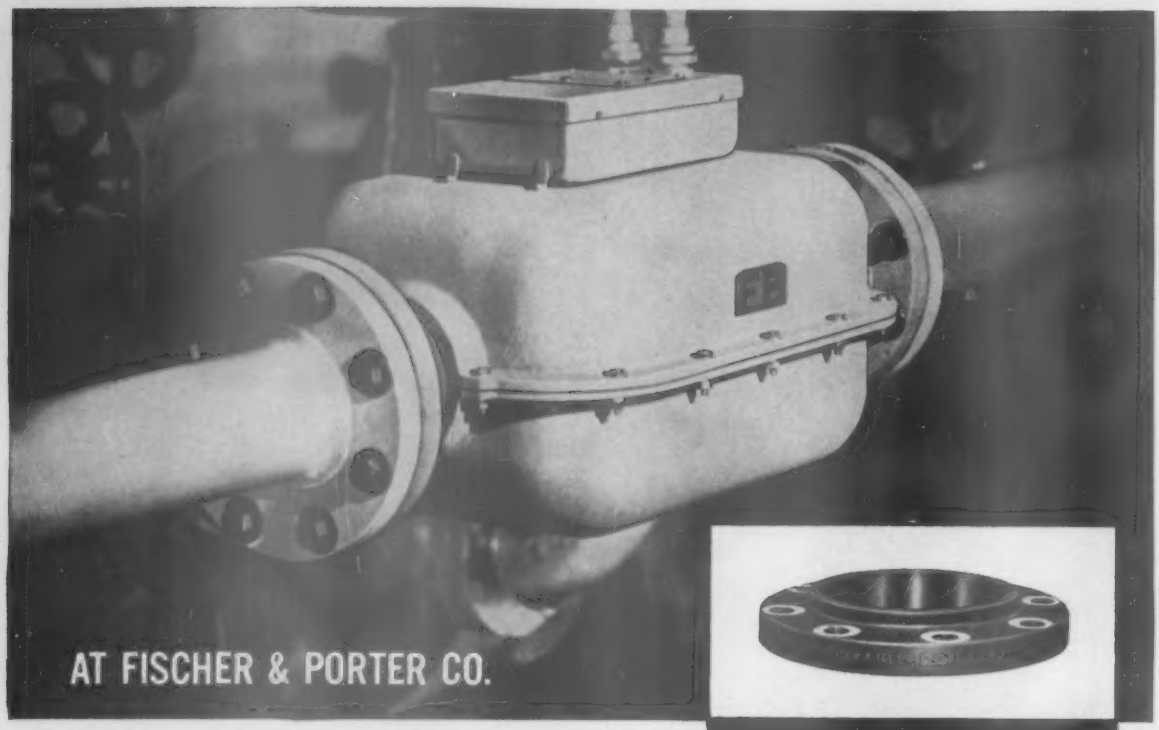

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Fischer & Porter, noted for their quality metering devices, manufacture Magnetic Flowmeters used by all industries where accurate flow measurement is required. Accuracy can be held to plus or minus 1% even under the most difficult operating conditions. At their plant in Hatboro, Penna. their design, engineering, production and purchasing departments all demand quality and service. That's why Phoenix pipe flanges have been specified and relied upon for years.

Specify Phoenix too. You can't buy a better flange.

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YOU GET ALL THIS IN PHOENIX FLANGES:

- Forged Steel. Shot Blasted.
- Full A.S.A. Specifications—Carbon Steel and Alloy.
- Spot-faced Bolting Surfaces, Extra Fine Facings, Accurate Threading and Protective Coating
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CATASAUQUA, PA. • JOLIET, ILL. • FOUNDED 1882

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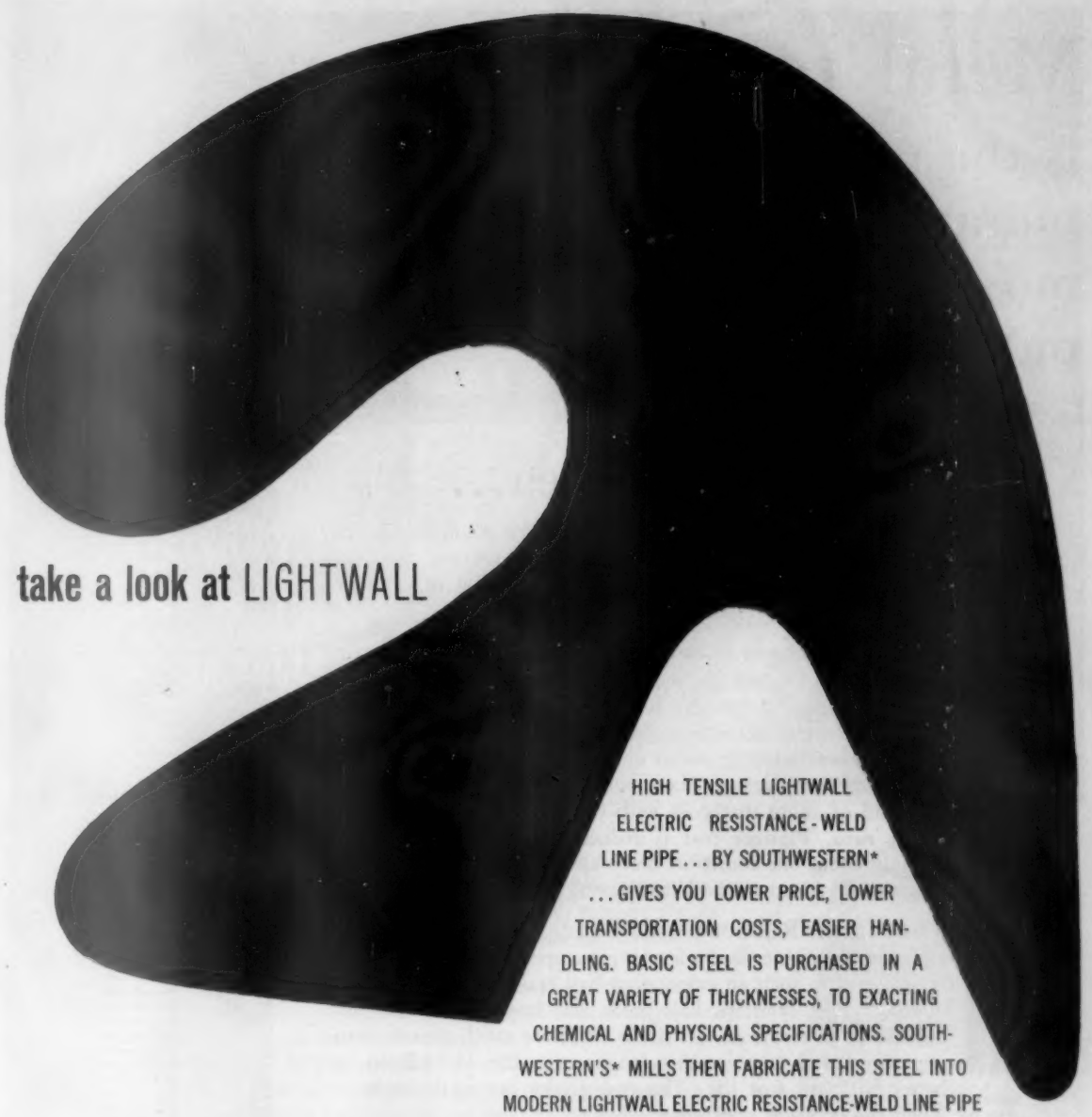

take a look at LIGHTWALL

HIGH TENSILE LIGHTWALL ELECTRIC RESISTANCE-WELD LINE PIPE... BY SOUTHWESTERN* ...GIVES YOU LOWER PRICE, LOWER TRANSPORTATION COSTS, EASIER HANDLING. BASIC STEEL IS PURCHASED IN A GREAT VARIETY OF THICKNESSES, TO EXACTING CHEMICAL AND PHYSICAL SPECIFICATIONS. SOUTHWESTERN'S* MILLS THEN FABRICATE THIS STEEL INTO MODERN LIGHTWALL ELECTRIC RESISTANCE-WELD LINE PIPE TO PROVIDE THE HIGHEST DEGREE OF EFFICIENCY AT THE LOWEST POSSIBLE COST. SOUTHWESTERN* PRODUCES LIGHTWALL PIPE FROM 1.315" O.D. TO 4.500" O.D. IN WALL THICKNESSES UP TO .188 WALL. YOU CAN DEPEND ON OUR PROMPT, RELIABLE DELIVERIES, DUE TO OUR FLEXIBILITY AND OUR LARGE INVENTORIES OF SELECTED STEEL COILS.

SOUTHWESTERN PIPE, INC.*

Corporate name changed from Southern Sales & Transportation Co, May 1st, 1959

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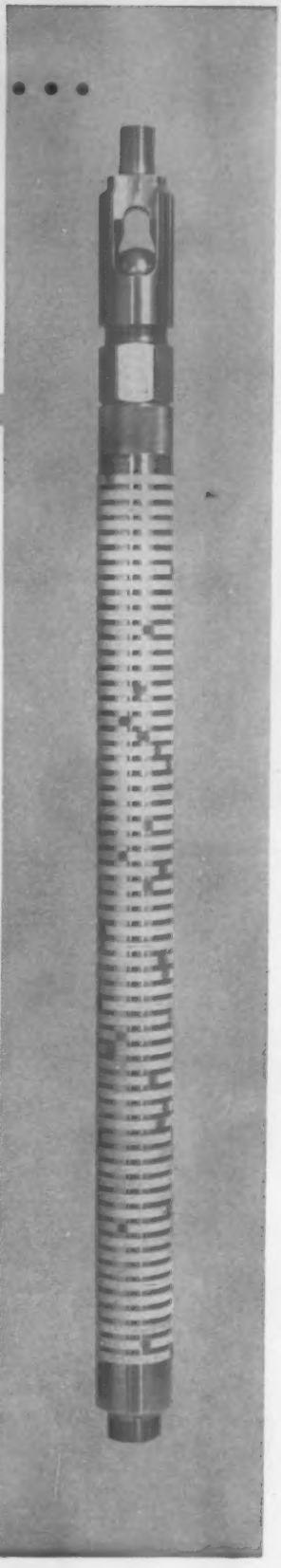
LICENSED BY THE AMERICAN PETROLEUM INSTITUTE

Metal to Metal Wear...

is the real villain in sucker rod pump troubles. It accounts for most of your repair and pump pulling expense.



The Martin Idea...

for getting away from this trouble has always been to make use of the best available materials — *Natural Rubber* for the key material in plunger rings; *Synthetic Rubber* for the key material in resilient ball guides for cages.

The accurately grooved and drilled metal body of **The Martin Plunger** does not touch the barrel. Only the resilient rubber and duck rings contact the barrel. This material — with its great natural resistance to abrasion as well as its slipperyness-when-wet — has a much slower wearing action on the barrel. Most often your barrel will not need replacing. These rings have an amazing ability to take the kind of abuse that goes with oil well pumping, and this means longer runs. Plunger cost is reduced because replacing the rings costs only about one fourth as much as a new plunger, and this saving is, of course, added to the barrel saving and longer runs.

Patent No. 2,591,174

The Martin Rubber Guide Cage protects the ball from all metal contact except when it rests upon its seat. The ball is protected to such an extent that ball and seat life is usually doubled. The synthetic ball guide and stop cannot beat out because of its resilience. Its life is therefore much greater than any metal and you get this longer cage life in addition to better ball and seat life. The two guides are easily replaced when the occasion does arise.

No real capital outlay is required to get these benefits because the cost of Martin Plungers and Martin Cages is very much the same as you are now spending for replacements — sometimes less.

All regular or stroke-thru ROD PUMPS and TUBING PUMPS can be equipped with Martin Plungers. Martin Rubber Guide Cages are made in all sizes and styles. Write for our catalog No. 4; also see Composite catalog for 1956-57.

JOHN N. MARTIN

Manufacturer

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SCOTCHRAP

BRAND

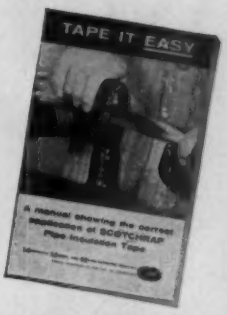
PIPE PROTECTION

Tapes are TOUGHER!

Proved by 200-hour torture test!

Each of the five lengths of pipe shown was covered with a different protective coating—both tapes and mill coatings. They were then fastened in a barrel containing abrasive tumbling chips and continually tumbled for 200 hours. This unretouched photo shows the results: only the "SCOTCHRAP" Pipe Protection Tape, far right, survived intact!

This controlled test was designed to measure the resistances of various coatings to backfilling and soil stresses. It clearly demonstrates the superior abrasion and puncture resistance and excellent bond strength you get *only* with "SCOTCHRAP"—the toughest polyvinyl chloride plastic tape. These properties are so superior that with normal care, no protective overwrap is needed. Add the excellent electric properties, and you have the reasons why we believe "SCOTCHRAP" is the best total coating buy you can make.



SEND FOR FREE MANUAL!
New "Tape it Easy" booklet gives application methods, useful specifications, for "SCOTCHRAP" Pipe Protection Products. Write 3M Co., St. Paul 6, Minn., Dept. EAK-119.

FOR **MAXIMUM ABRASION RESISTANCE . . .**
EXCELLENT PUNCTURE RESISTANCE . . .
MAXIMUM RESISTANCE TO SOIL STRESS . . .

PLUS **EXCELLENT ELECTRICAL PROPERTIES**

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SCOTCHRAP BRAND **Pipe Protection Products**

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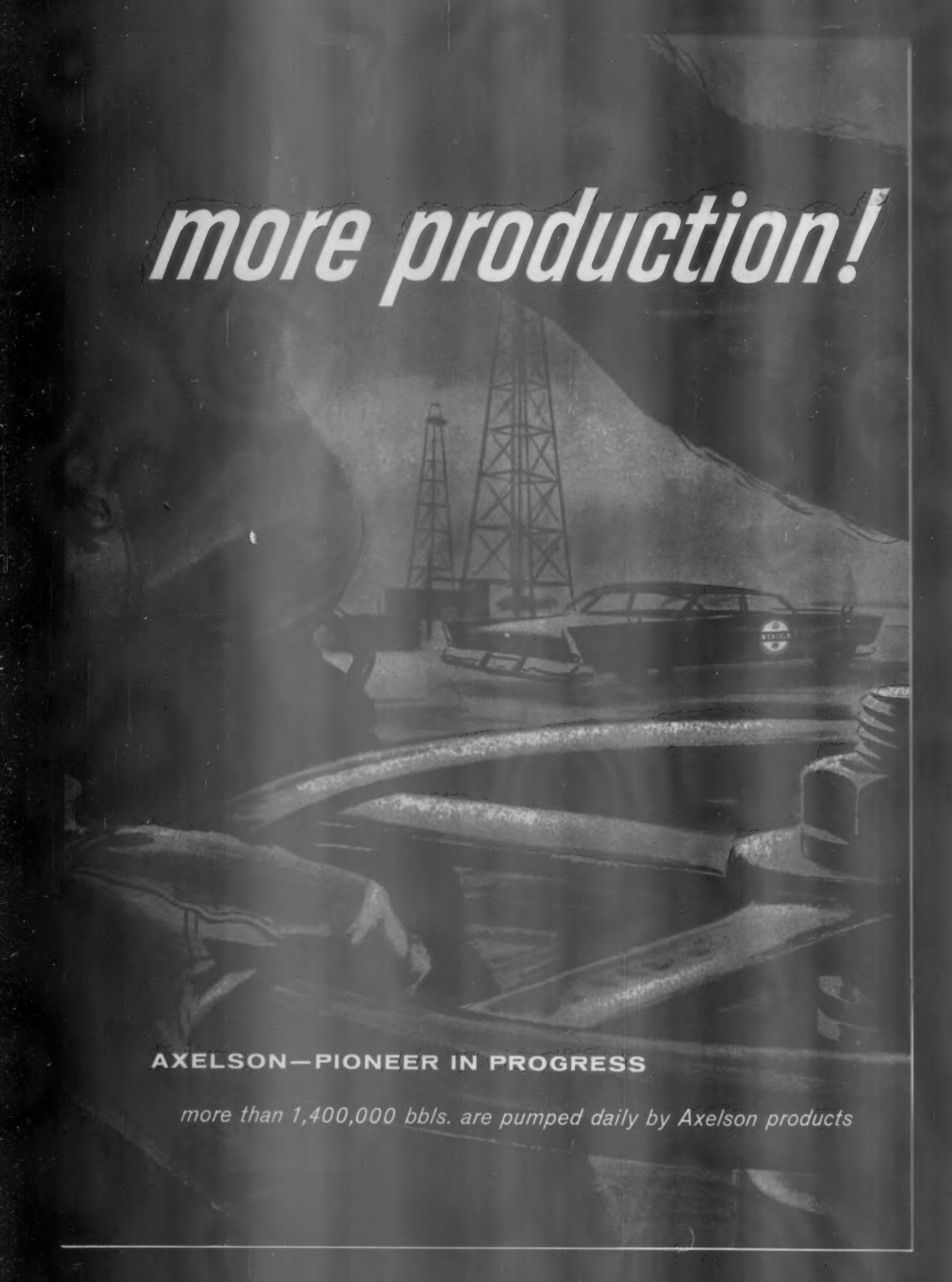
MINNESOTA MINING AND MANUFACTURING COMPANY
. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY


more production!
AXELSON—PIONEER IN PROGRESS
more than 1,400,000 bbls. are pumped daily by Axelson products

22%-60% MORE *with*

AXELSON VOLUMAX

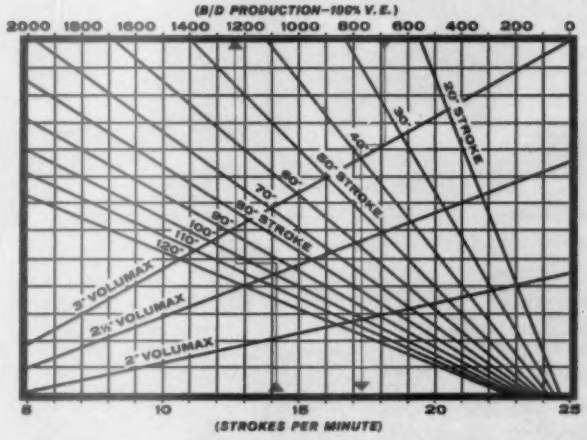
for example:

- In 2" tubing, 2" Volumax (1½" bore) outproduces insert pumps by 66% – tubing pump by 22%.
- In 2½" tubing, 2½" Volumax (2" bore) outproduces insert pumps by 63% – tubing pump by 29%.
- In 3" tubing, 3" Volumax (2½" bore) outproduces an insert pump by 53% – tubing pump by 27%.

PERFORMANCE FACTS

- An insert-type pump, the Volumax allows entire subsurface pumping equipment to be pulled with rods.
- Volumax achieves more production than tubing pump without changing stroke length or cycles per minute.
- Produces equal volumes as tubing pump at reduced cycle rate, reduces dynamic stresses in rod string.
- Allows use of shorter stroke surface unit in shallow, high volume wells.

HERE'S HOW TO APPLY THE VOLUMAX



REPLACE WITH AXELSON

Axloy Balls and Seats, made of a special analysis of stainless steel, are extremely durable under all pumping conditions. Each highly polished ball is mated with its own seat and tested under vacuum to insure perfect action.

Write for New Volumax Pump Brochure

NEW VOLUMAX PUMP

USI Axelson

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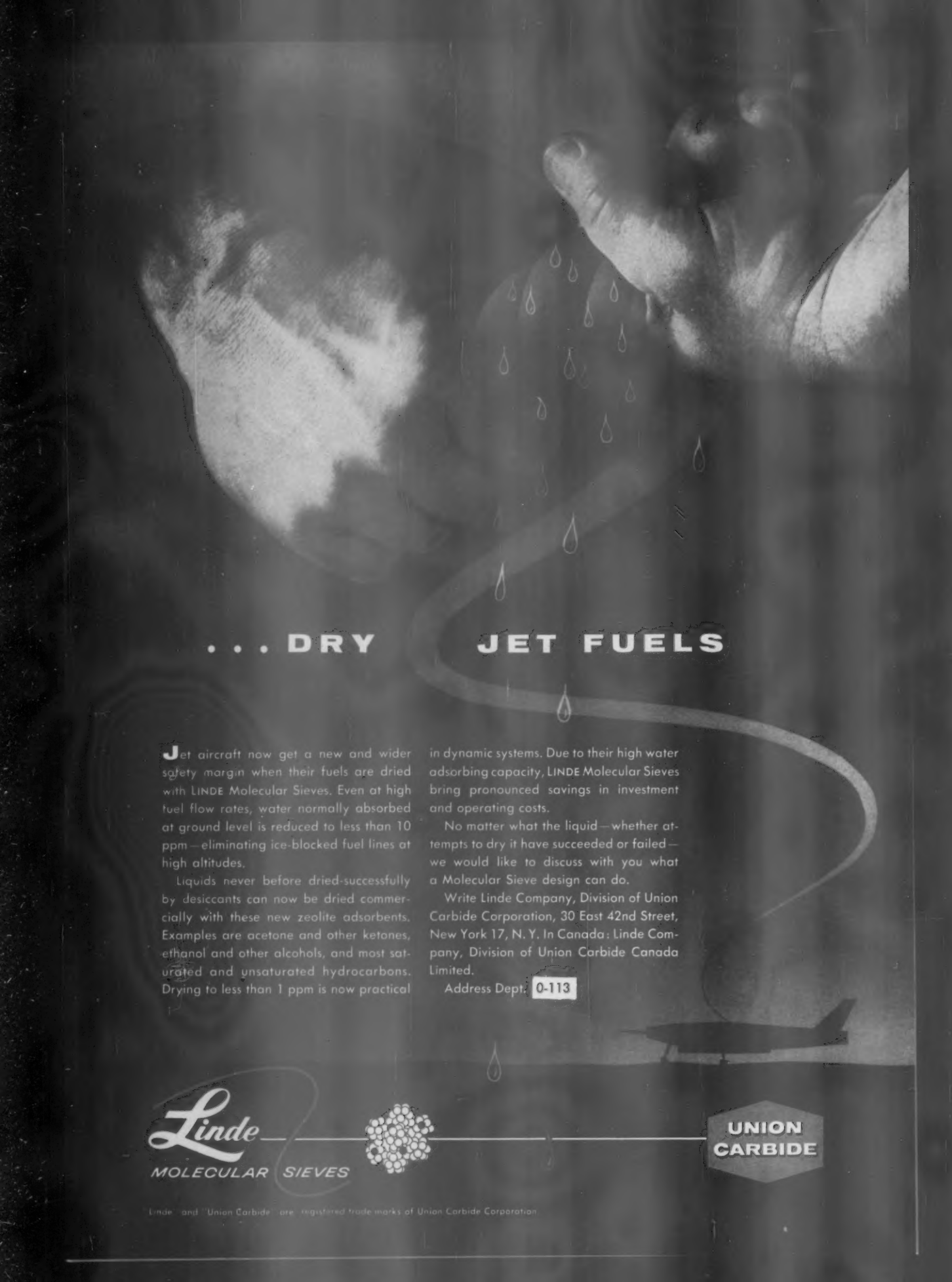


. . . DRY JET FUELS

Jet aircraft now get a new and wider safety margin when their fuels are dried with LINDE Molecular Sieves. Even at high fuel flow rates, water normally absorbed at ground level is reduced to less than 10 ppm—eliminating ice-blocked fuel lines at high altitudes.

Liquids never before dried-successfully by desiccants can now be dried commercially with these new zeolite adsorbents. Examples are acetone and other ketones, ethanol and other alcohols, and most saturated and unsaturated hydrocarbons. Drying to less than 1 ppm is now practical in dynamic systems. Due to their high water adsorbing capacity, LINDE Molecular Sieves bring pronounced savings in investment and operating costs.

No matter what the liquid—whether attempts to dry it have succeeded or failed—we would like to discuss with you what a Molecular Sieve design can do.

Write Linde Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. In Canada: Linde Company, Division of Union Carbide Canada Limited.

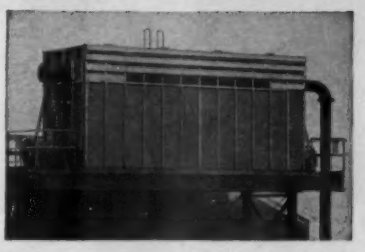
Address Dept. 0-113

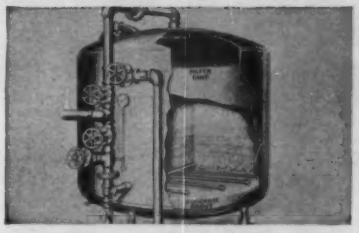
Linde MOLECULAR SIEVES

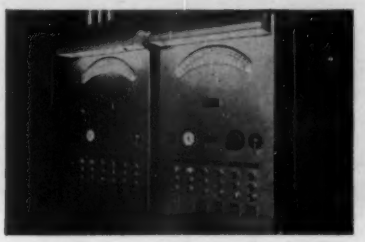
UNION CARBIDE

Linde and Union Carbide are registered trade marks of Union Carbide Corporation

You get dependable performance for all types of brine and water treatment with INFILCO equipment







ACCELATOR®
plants for clarification, softening and stabilization
Effective mixing of chemicals and raw water with recirculating slurry and downflow separation effect better treatment in minimum area — and at low cost. For water, brine or waste treatment.
BULLETIN 1825

CHEMICAL FEEDERS
Accurately controlled feed rates and maximum economy
Compact designs for automatic or manual control, for all types of chemicals. Type E Feeders dispense dry chemicals volumetrically, from bulk storage to dry or wet applications. BULLETIN 215

NEUSOL® FEEDERS
Wide feed range, corrosion resistant construction adapt this versatile and dependable displacement feeder to most chemical solution requirements.
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AERATORS and DEGASIFIERS
For all types of gas-liquid transfer applications. Efficient oxidation, carbon dioxide and hydrogen sulfide removal.
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Request information on recarbonators, deaerating heaters and vacuum degasifiers.

PRESSURE FILTERS
Standard or special construction for the most exacting process requirements
Vertical or horizontal, sand or anthracite types with manual or automatic controls for water or brine filtration. BULLETIN 1520
The STELLAR® diatomite filter, with its exclusive "gas-bump" cleaning is standard for amine solutions in most of the largest gas companies. BULLETIN 1560

MODERN INSTRUMENTATION
Maintains efficiency, reduces operating cost of treatment
Design and assembly of pneumatic, electric or hydraulic control components for manual or automatic, constant or variable rate plants. Operating consoles and control panels specifically engineered for complete treating plants. BULLETIN 1100

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57402

INFILCO CAN help you solve any water and brine treatment problem in oil production and refining

From experience, extending over 60 years, INFILCO can give you the best results with lowest *first* cost and *operating* costs.

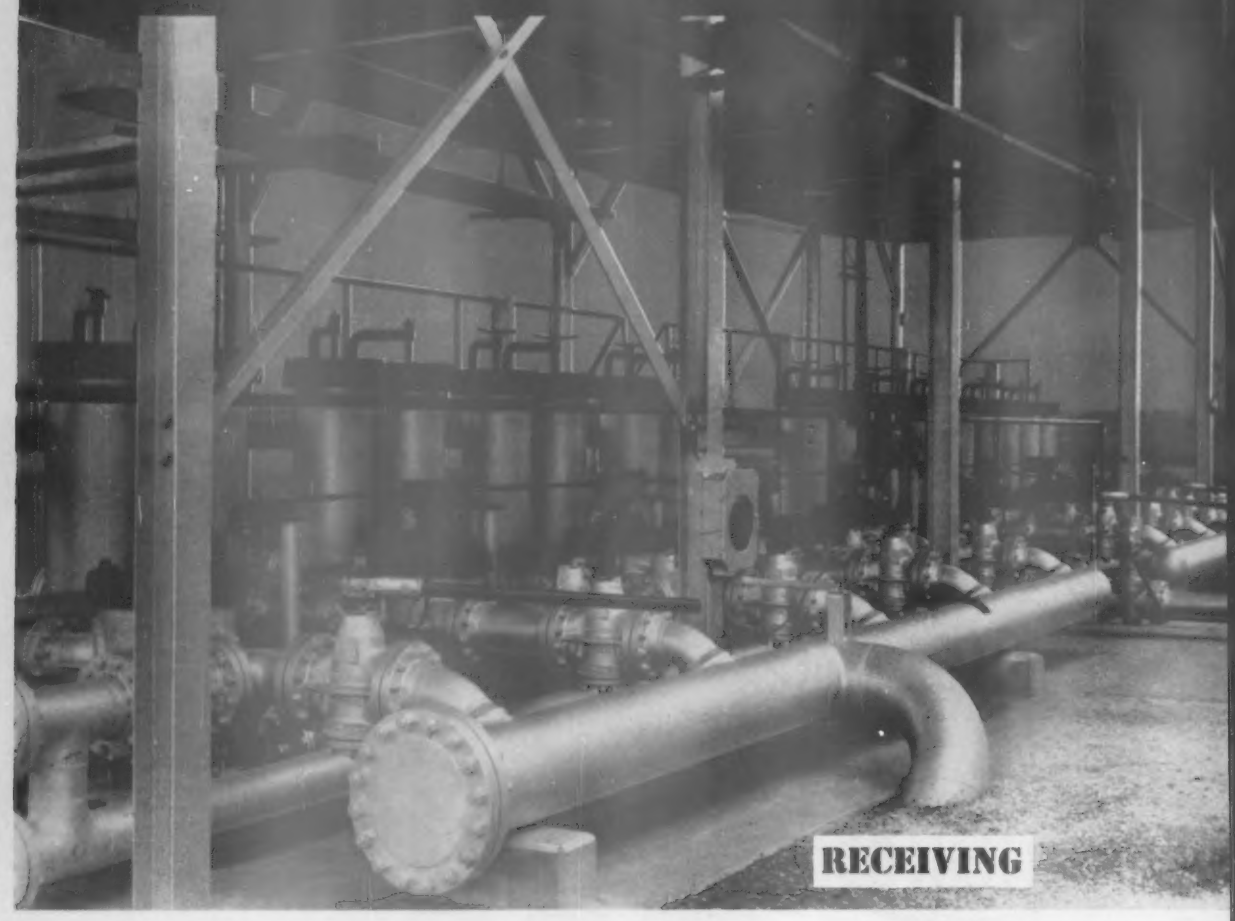
No other line of equipment is so complete—none so advanced in method and design. Above are a few examples.

It will pay you to investigate. Inquiries are invited on all matters relating to water or brine treatment. Write today for new condensed catalog, Bulletin 80, for a more complete description of INFILCO products.

THE ONLY COMPANY impartially offering equipment for ALL types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

A major products pipe line company

counts 'em COMING



4-company oil "bank" keeps accurate ledgers on product deposits and withdrawals

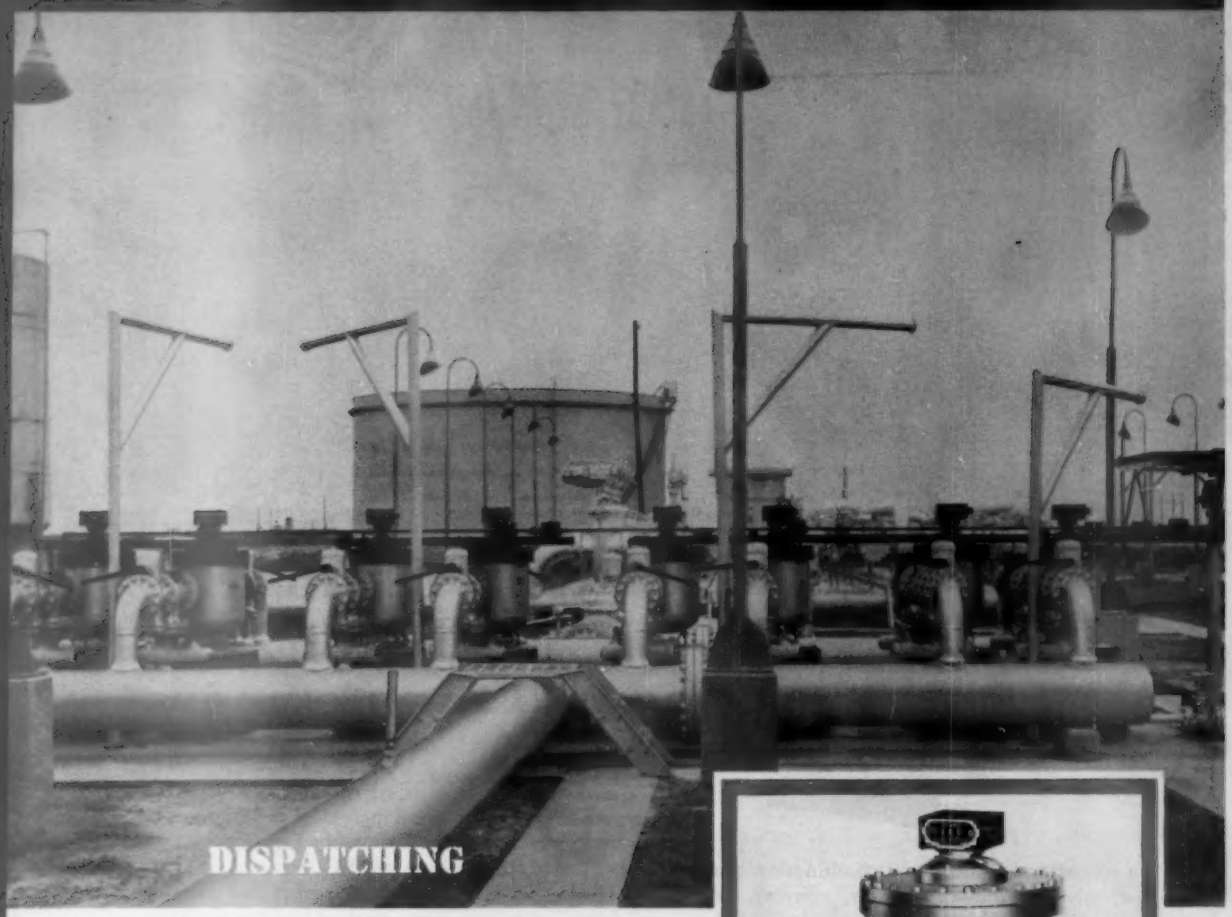
With four contributors working one terminal, accuracy is a must. And when this Gulf Coast installation was planned, the natural choice for keeping records straight was an A. O. Smith meter system.

The four lines feed through four separate A. O. Smith meter banks that register input within hundredths of a percent. A second set of meters measures and records individual deliveries from the product "pool" to the big 16-inch line.

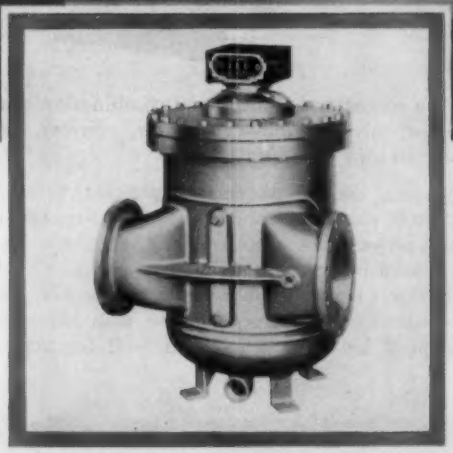
This modern replacement for old-fashioned tank gauging permits truly automatic operation — essential at such a complex installation. A. O. Smith meters provide for minimum use of tankage . . . save costly manpower . . . cut evaporation losses too. Capacity is 170,000 barrels.

This Gulf Coast terminal is just one example of job-site benefits that can be duplicated for you by A. O. Smith. For more information, contact your A. O. Smith meter man or write direct.

and GOING



A. O. Smith measures your needs — then recommends the metering setup that gives you the most accurate and economical service. Like this company, you can benefit by depending on A. O. Smith for meters.



Compact A. O. Smith positive-displacement line meters account for every drop and print a permanent record — automatically.

Through research ...*a better way*

A.O.Smith
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Factories: 5715 Smithway St., Los Angeles 22, California; Erie, Pennsylvania • Offices: Atlanta 5, Ga.; Chicago 3, Ill.; Houston 2, Texas; Los Angeles 22, Calif.; New York 17, N. Y.; Oakland 21, Calif.; Tulsa, Okla. Canada: Toronto 12, Vancouver 1. • A. O. SMITH INTERNATIONAL S. A., MILWAUKEE 1, WISCONSIN, U.S.A.

REDUCE COSTS
of electrified
OIL WELL PUMPING

This pump, near Odessa, Texas, is driven by a 25 hp motor and transformer combination.

Wagner oil well pumping motors, with matched service transformers, are built in ratings of 5 through 40 hp.

with Wagner *MATCHED* Motors and Transformers

Here's a motor and transformer combination that's built for only one job—*dependable, efficient, cost-cutting oil well pumping.*

The motor has high torque (400 per cent) to handle initial loads without laboring or stalling. It has high slip (7 to 11 per cent) for smooth running under cyclic loads. Class B Insulation protects the motor windings, provides greater thermal capacity to safely absorb the heat from peak loads. You get more production with less energy consumption because the motor is built for the job.

The transformer is matched to the motor—puts an adequate, dependable power supply close to the load. You can electrify oil well pumping leases by bringing the high voltage line to each well installation . . . operate each well individually. You save up to 25 per cent in line materials and labor — eliminate many dead ends — reduce system losses by as much as 65 per cent.

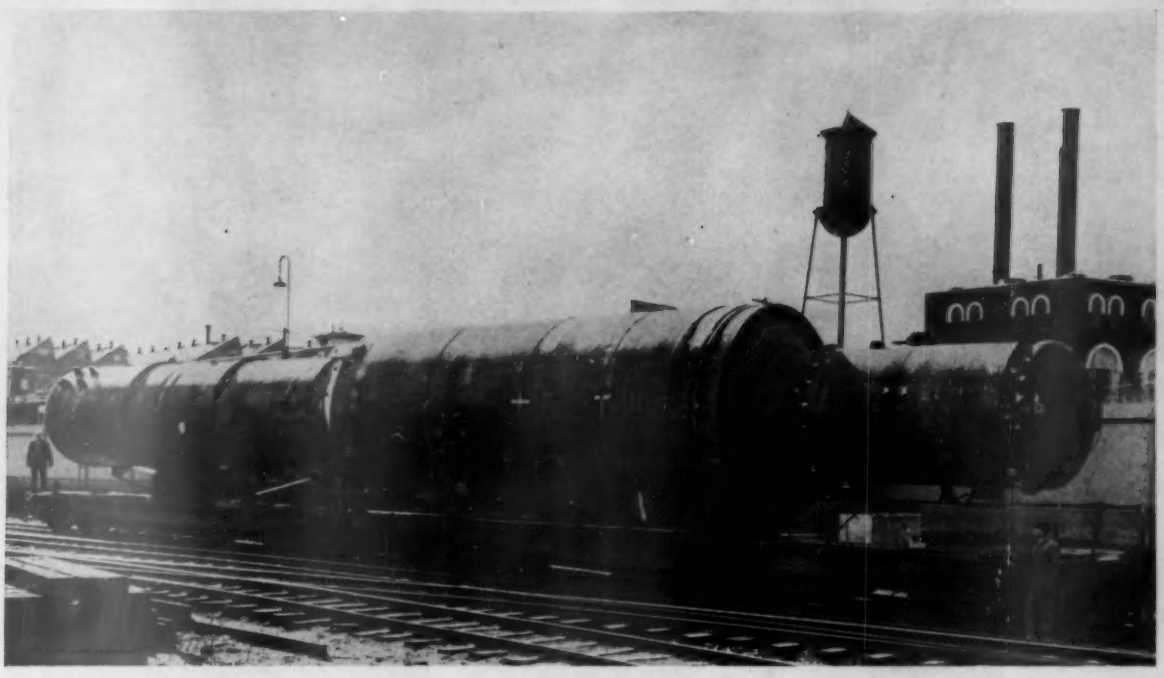
Your nearby Wagner field engineer will be glad to tell you about the Oil Well Pumping Motor and Transformer Combination, help you plan oil well pumping, gathering and water-flooding systems, assist you in solving your electrical problems. Call him today, or write for Bulletin EU-426A.

WM59-14

Wagner Electric Corporation

6389 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

SERVING 2 GREAT GROWTH INDUSTRIES . . . ELECTRICAL . . . AUTOMOTIVE



VERSATILITY

SOLVES PROBLEMS IN SHIPPING PROCEDURE

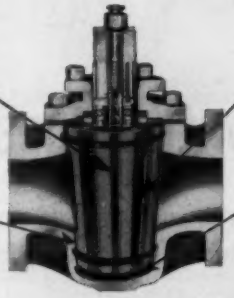
The variety of large-size work which Sun Ship's shops produce is matched by a variety of equally important shipping problems. Sun's facilities for shipping by water (overseas, coastal, or inland)—directly from our plant, are often the most economical available, and when large pressure vessels, such as those shown here, are scheduled for overseas shipment, direct, plant-to-ship loading saves additional time and expense.

Inland customers benefit from our ability to pre-check clearances and schedule shipments by rail or truck before production ever begins, so that delivery on schedule . . . on budget . . . is assured. Thus VERSATILITY . . . which has been made a "standard procedure" through Sun's experience . . . is extended through one more avenue . . . Shipping Procedure.

BURY 'EM AND FORGET 'EM...

THEY'RE LUBRICATED VALVES

Take a good look . . because these valves will be buried for a long time. A periodic "shot" of lubricant is usually *all* the attention these valves require to keep them leak-proof and trouble-free for the life of the pipeline. On thousands of pipeline installations over the past 40 years, service records prove that Rockwell-Nordstrom valves shut tighter, open easier and keep maintenance costs lower than non-lubricated valves. The lubricant seal keeps it working at peak efficiency for many years, while providing lower operating costs and added dependability. There is no metal-to-metal friction on moving parts, because they ride on a film of lubricant, and this same lubricant creates a powerful double seal against leakage. Whatever your valve requirements, specify from Rockwell-Nordstrom, the original and the world's *most complete line* of lubricated plug valves and plug valve accessories. For details, write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.


Lubricant makes ¼ turn operation smooth . . . easy.
Pressurized lubricant in Sealdport® sealing grooves stops leakage of even lightest gases.
Lubricant stops metal-to-metal friction for longer valve life at lower cost.
Pressurized lubricant "cushions" plug for instant operation.

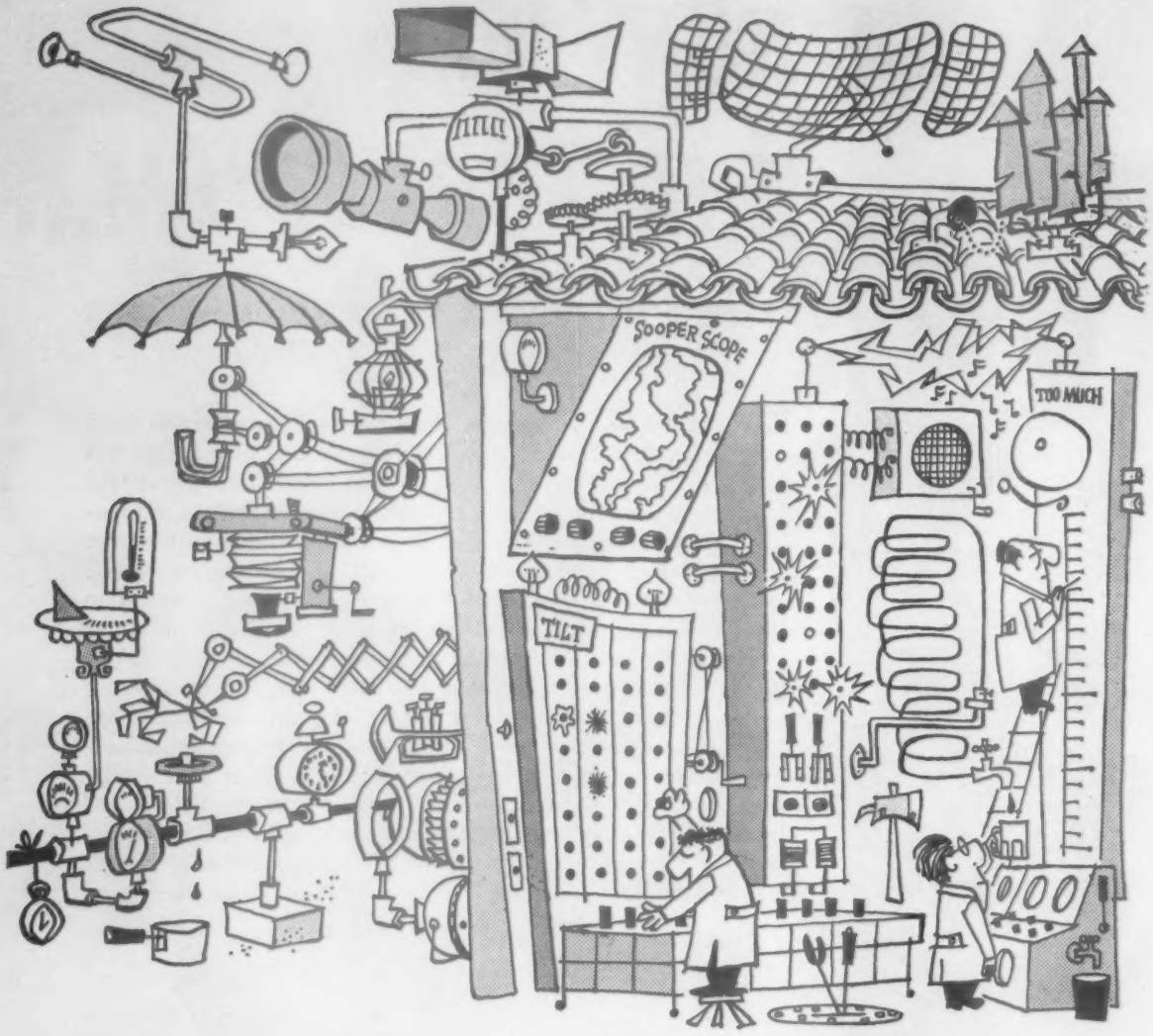
Note the absence of expensive vaults. Extended gearing on Rockwell-Nordstrom Lubricated Plug Valves eliminates the need for them.

Lubrication makes the difference

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL



How much control does your pipeline need?

If you have some imagination, like our artist, you can go hog-wild in working out a pipeline control system. If you really wanted it, Union Switch & Signal could even give you a digital read-out of your mother-in-law's blood pressure a thousand miles away.

But clean engineering requires just the right amount of control. We've learned, after 78 years of hard knocks in the control business, that overdesign is just as bad as underdesign. We all strive for positive, reliable, informative, labor-saving control. No more. No less.

Union Centralized Transport Control can remotely operate a single booster station or an entire system. It can provide automatic sequencing, telemetering, data handling and display, data logging, instrumentation and communications.

Union CTC will lower your operating costs, and it is completely error-free. It's a new concept in pipeline control. Write to us so we can tell you about it.

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY —
PITTSBURGH 18, PENNSYLVANIA

The bank with the
OIL MAN'S
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FIRST CITY
NATIONAL **BANK** OF HOUSTON

Loans on oil or gas producing properties, secondary recovery, refining plants, pipe lines and many others.

HOUSTON, TEXAS

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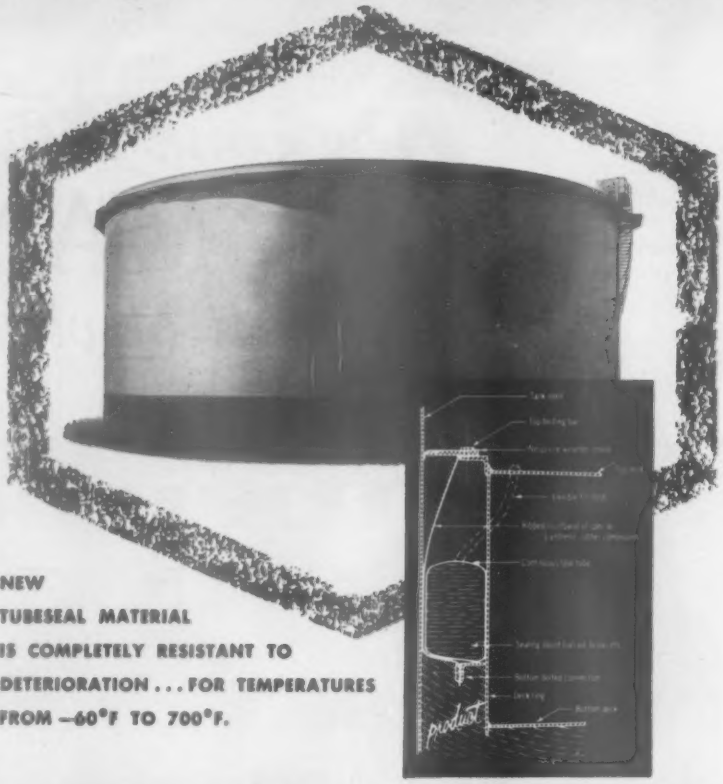
INSURANCE CORPORATION

NOW... Hammond TUBESEALS

Guaranteed for storage of HIGH AROMATICS

HERE'S GOOD NEWS FOR PRODUCERS AND HANDLERS OF HIGH AROMATIC CHEMICALS

Elimination of evaporation losses and protection against product contamination of high aromatics in storage is now possible with the new Hammond Tubeseal System* for floating rooftanks. The new tubeseal material overcomes deterioration problems experienced with other sealing materials. Tubeseals are guaranteed for storing products containing 75% aromatics and special materials are available for 100% aromatics. A Hammond Floating Roof Tank, with the new aromatic-resistant Tubeseal System, is the answer to liquid storage of high aromatics . . . and the Tubeseal Floating Roof can be installed on new or used tanks of riveted or welded construction.



NEW TUBESEAL MATERIAL IS COMPLETELY RESISTANT TO DETERIORATION . . . FOR TEMPERATURES FROM –60°F TO 700°F.

ELIMINATE LIGHTNING FIRES:

The Hammond weathershield, a standard part of the Hammond Tubeseal System, is completely electro-conductive to eliminate the possibility of lightning fires.

Send us the details on your storage facilities and requirements. We will be glad to offer you the benefits of more than 50 years of liquid storage experience.

INCLUDED AMONG THE AROMATICS AND OTHER CHEMICALS WHICH CAN NOW BE STORED IN HAMMOND TUBESEAL FLOATING ROOF TANKS ARE:

- ISOPROPYL ETHER
- ALLYL ALCOHOL
- ALLYL CHLORIDE
- HEXALENE GLYCOL
- ETHYL ALCOHOL
- ISOPROPYL ALCOHOL
- ETHYL GLYCOL
- BENZENE
- CREOSOTE OIL (CREOSOL)
- TOLUENE
- NAPHTHA and HYDROGEN SULFIDE
- TURPENTINE
- XYLENE
- BUTYL ALCOHOL
- SULPHURIC ACID 95%
- METHYLENE CHLORIDE
- TRICHLOROETHYLENE
- ETHYLENE DICHLORIDE
- BENZYL ALCOHOL
- AMYL ALCOHOL
- PROPANEDIOL

*Patented

HAMMOND IRON WORKS

HAMONDTANK

744 BROAD STREET, NEWARK 2, N. J.

now... longer life, improved performance for pipelines, crude units... with Unicor

Are you aware of the tremendous difference a small amount of Unicor can make in pipelines and crude units?

This film-forming, oil-soluble inhibitor prevents all kinds of corrosion. Wherever Unicor has plated out on a surface, it gives protection to tanks, vessels and pipelines whether full, part-full or empty.

By adding a small amount of Unicor to your product—10-20 parts to a million—you prevent product contamination, profit-robbing corrosion; assure maintenance of full-flow capacity and output.

Furthermore, use of Unicor substantially reduces filter cleaning and replacements, scraping operations, power costs and expensive downtime.

What Unicor does for tanks and pipelines it also accomplishes in crude units and other refinery equipment. For detailed information, write to our Products Department.

UOP®

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road,
Des Plaines, Illinois, U.S.A.

UNICOR®

The Arithmetic of Materials Handling

Fuller pneumatically conveys drilling mud directly into oil rig bins, from specially-fitted Bourg Mud & Chemical Co. supply ship. Ship carries 250 tons of mud, delivers at a rate of 50 tons an hour.

Sea-Going Fuller Pneumatic Conveying System Cuts Time and Cost of Vital Drilling-Mud Deliveries

The Bourg Mud & Chemical Co., Inc., of Lockport, La., is making off-shore deliveries of drilling mud by advanced Fuller pneumatic systems.

The dry mud is automatically pumped aboard oil rigs from a Fuller equipped cargo ship at a rate of 50 tons an hour—one man replacing large crews handling 100-pound sacks in cargo nets. Previously, bag handling in high seas had been either dangerous or impossible. The highly flexible bulk-handling system now operates safely and efficiently at all times.

Self-emptying hoppers designed and built by Delta Tank Manufacturing Company installed into the Bourg ship are fitted with F-H Airslide® fluidizing gravity conveyors. A 6-inch Fuller-Kinyon pump transfers the aerated material to bins aboard the rig—over distances up to 300 feet. Air pressure is supplied by a diesel-driven Fuller single-stage vane-type rotary compressor.

Here is a good example of Fuller's engineering experience and wide range of equipment combining to solve your materials handling problem. If you handle large volumes of dry bulk granular materials, why not investigate a simple, efficient Fuller pneumatic conveying system? For details, write or call Fuller today outlining your problem.

1311
P-171-A

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FULLER COMPANY
132 Bridge St., Catasauqua, Pa.
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Fuller
... pioneers in harnessing AIR

CORROSION

How Lukens *Application Research* can help you find the right steel plate for the job

Migrating ions—superimposed on a photomicrograph of corroded steel plate—symbolize one of metallurgy's oldest assignments: the battle against corrosion. Developing new tactics in this constant campaign is the job of our Application Engineering staff.

For example, called on early in the planning stages, Lukens engineers recently attacked almost identical problems for two large processing companies—and came up with two completely different solutions.

The first involved a sugar refiner's vacuum pans. Frequent and costly cleaning was required to head off corrosion and product contamination. Our staff's prior research and experience in the food equipment field led it to suggest *nickel*-clad steel for the pans. (13% and 8% nickel-clad on A-285 backing steel.)

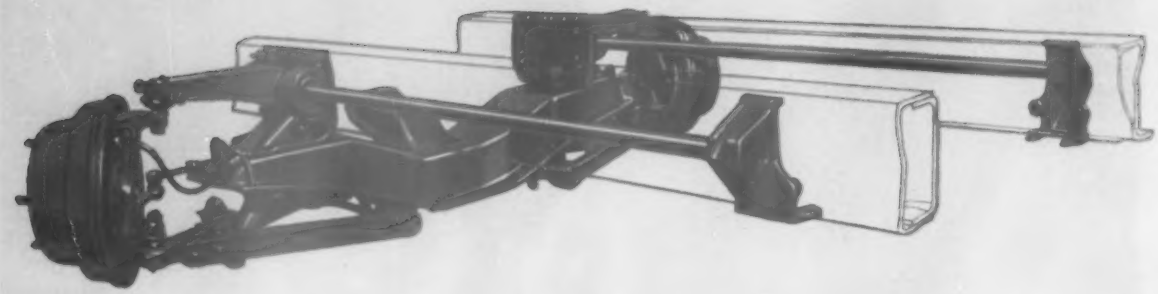
Cleaning and maintenance were equally costly to a leading chemical and dye company—in the protection of its nitrogen solution barge tanks. Here, our engineers found *stainless*-clad steel the most desirable answer. (12% 304L on A-212 backing steel.)

Armed with practical as well as technical knowledge of Lukens' wide range of special-duty steels, our Application Engineers have helped conquer corrosion on many fronts. That's why we say . . . *if your assignment is corrosion, let it be our assignment, too.* Contact Manager, Application Engineering, P-119 Services Building, Lukens Steel Company, Coatesville, Pa.

Helping Industry Choose Steels That Fit The Job

LUKENS

ASK FOR THE BULLETIN ON LUKENS CLAD STEELS



CHEVROLET'S REVOLUTIONARY TORSION-SPRING RIDE

the most significant new truck development in decades!

Years of intensive engineering achieved a revolutionary result—a totally new truck suspension system. The most exhaustive chassis engineering program in trucking history proved conclusively that, from the standpoints of both ride and durability, the finest possible truck suspension system would consist of independently suspended front wheels with torsion bar springing. Advancing on this principle, Chevrolet engineers proceeded through years of development to produce a completely new system for the 1960 Chevrolet truck product.

New Torsion-Spring Ride—how it works. The revolutionary result of Chevy's all-out engineering effort—Torsion-Spring Ride—eliminates both the old-fashioned I-beam front axle and friction-producing front leaf springs. Each front wheel, suspended independently of the other through tough control arms and low-friction linkage, is free to step cleanly over bumps without jarring the entire truck. Also, friction-free torsion bars on either side of the chassis, specially mounted to provide a twisting action, work to absorb each jolt; they flex freely to soak up all kinds of shocks, from the smallest to the most severe.

Three new rear suspensions, tough and tailored to the truck, are completely redesigned to complement the independent front suspension in every weight class.

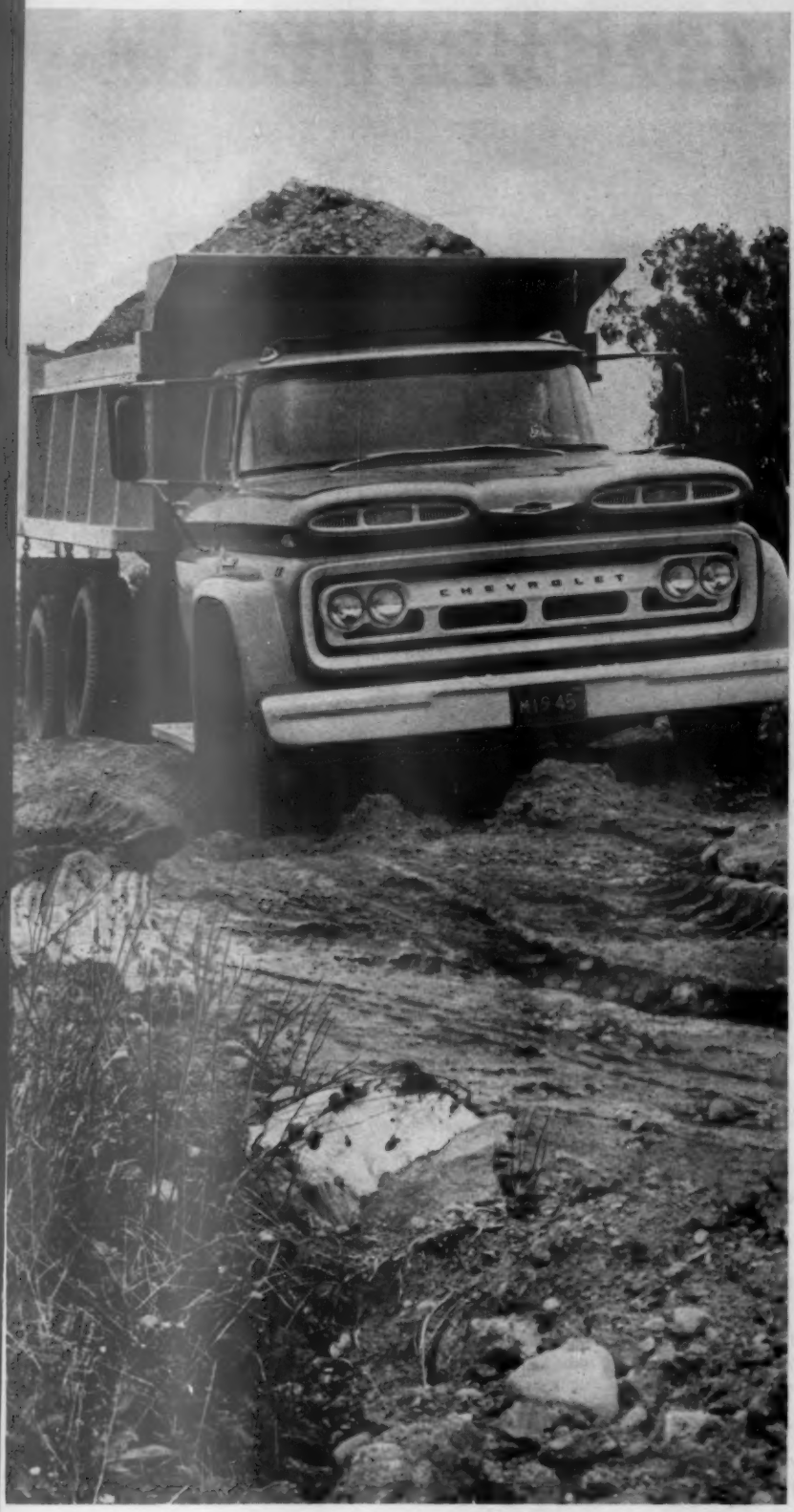
Here's a ride that lets you get more work done in a day's time! Take a '60 Chevrolet truck over a rough stretch of back road and feel the absence of I-beam shimmy and wheel fight. Chevy's torsion springs soak up jolts and jars that would shake the headlights off an ordinary I-beam rig. You move along with maximum payloads at higher safe cruising speeds. You make off-the-highway runs in less time, improving your ton-mile-per-hour rate as much as 100%.

A ride that shows respect for the driver and the load! Out at the GM Proving Ground, the test drivers will take a torsion-spring Chevy any day over an I-beam truck—even if they have to drive it twice as far. The ride's that much better; that much safer. The load, too, has an easier time of it. There's far less bounce and jounce, less danger of damaging fragile cargoes.

A ride that adds extra thousands of miles to the truck's working life! You can be sure the shockproof action of Chevrolet torsion-spring ride means lower maintenance costs. As much as 78% of all objectionable road shock and vibration is absorbed before it can be transmitted to the truck's body and sheet metal. Chevy trucks stay new-looking a whole lot longer and their working life is increased by extra thousands of miles.

Once you've experienced the incredible smoothness of a torsion-spring ride, you'll realize that Chevrolet has set off a full-scale revolution with the introduction of its '60 models. By throwing away the old-fashioned I-beam in favor of independent front suspension, Chevy's new design has improved virtually all phases of truck performance. Drive a new one just once. That's all we ask. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

1960 CHEVROLET STURDI-BILT TRUCKS



How tough is Chevy's total newness?

Grueling, year-long torture test proves Chevrolet's do-the-job durability!

The proof is in the performance . . . and one of the most exhaustive tests in trucking history proved beyond question the stamina and staying power of Chevy's totally new suspension system and over-all design for '60.

At the General Motors Proving Ground, near Detroit, a punishing 5.2-mile test course was specially laid out to exceed the most severe operating conditions found in America. Twelve months ago, a standard 1960 Chevrolet Series M70 tandem model, overloaded for testing purposes, rolled onto this truck-busting course. It has been running continually ever since!

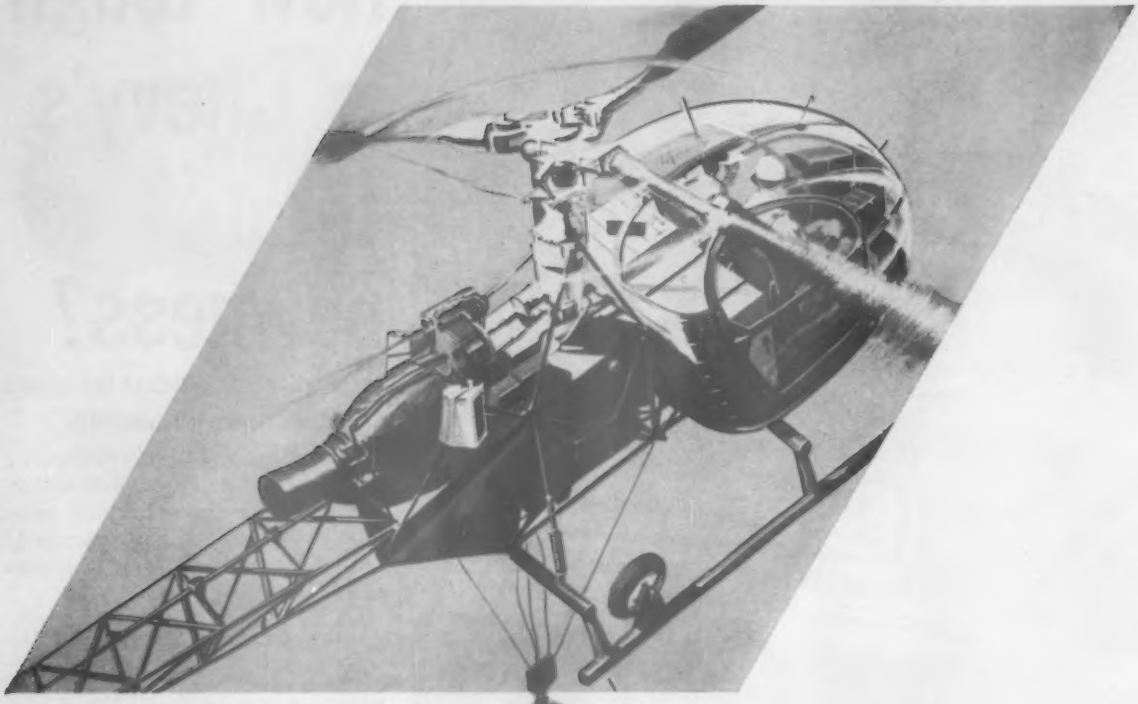
Every lap submits both the front and rear suspension to maximum stress, rolls it over buried logs and chassis-pounding bumps of all kinds, moves the suspension system into maximum positions of twist and compression. Impacting over boulders and potholes, on the straightaway and in turns subjects the front suspension to a brutal beating seldom encountered even in off-the-road operations. To test the effects of high frequency vibration, one section of the course is over an extreme washboard surface. On every lap, each component receives maximum punishment on this twisting, turning route.

Yet, after twelve hard months, under all kinds of weather conditions, this 1960 Chevrolet is still going strong, with *no major component failures* of any kind! That's the equivalent of nine tough seasons of truck operation . . . and it's conclusive proof of the strength and durability of Chevrolet's totally new trucks for '60!

CHEVROLET

They're worth more because they work more!

THE ALOUETTE SAVES REGULARLY...



ON EVERY MISSION

In transporting, hauling, spraying, aerial inspection, construction work, stringing wire, or at nearly any job, the turbine-powered ALOUETTE II — operating in heat or cold, at high or low altitudes — SAVES DOLLARS.

PROOF: Check these facts:

- ✻ *An Alouette sprayed an acre of brush along a remote powerline right of way in only 20 seconds for $7.26*
- ✻ *An Alouette transported four surveyors 20 miles to a 9,000 foot mountain landing at a total cost per man of $12.50*
- ✻ *An Alouette lifted and carried a 900 lb. seismographic drill rig 2 miles for $5.00*
- ✻ *An Alouette strung 8,000 feet of ⅜ inch steel cable in 1 hour and 40 minutes for $210.00*
- ✻ *An Alouette erected 30 telephone poles in 1 hour and 10 minutes at a total cost of $175.00*

Regardless of the task or climate . . . the low-maintenance Alouette brings ECONOMY to helicopter operations. Contact Republic's Helicopter Division for complete details on any of the above missions and on how the Alouette can help fill your needs.

*Designed by Sud Aviation

The Alouette is assembled, tested and distributed by:

REPUBLIC AVIATION CORPORATION

HELICOPTER DIVISION

Farmingdale, Long Island, N. Y.

NEED QUICK DELIVERY OF CASING?

Just contact the nearest stocking point for Armco Casing

New steels are born at Armco

Armco Slip-Joint Casing is distributed by National Tank Company from 21 locations throughout the oil country. Chances are, you can get immediate delivery from the stocking point nearest you. National Tank's representatives will also promptly handle your order for direct mill shipments.

For complete data on Armco Casing, write for catalog, "Armco Casing for Oil and Gas Wells." Armco Drainage & Metal Products, Inc., 6969 Curtis Street, Middletown, Ohio, or 201 KOME Building, Tulsa, Oklahoma.

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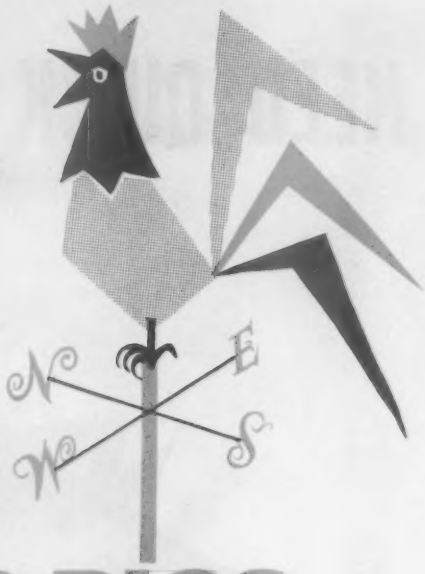
OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
The Armco International Corporation • Union Wire Rope Corporation



Cooper
DOUBLES RIGS HAVE ARRIVED

In only a few months Cooper Skytop Rigs have gone to work in Louisiana, East Texas, West Texas, Gulf Coast, Texas Panhandle, Mississippi, Montana, North Dakota, Wyoming, Oklahoma, Canada, and Mexico. But that's not all, many more are on the way because Cooper Skytops are setting new standards for oil well servicing. If they are not now working near you they will be soon.

Watch for them and see them work. Then you will know why these rigs are called the hottest unit to hit the oil fields since Cooper Winch Tractors changed well servicing ideas in 1918.

USERS SAY THEY LIKE . . .

"Racking pipe in doubles."
"Derrick hydraulic system for power subs, tongs and other power tools."
"No more load guylines to the ground."
"They handle any load so easy."
"Have real field portability."
"Time saved doing the job."
"Fast, easy rig up and rig down."
"Highway travel without special permits."

SEE A COOPER REPRESENTATIVE OR WRITE, WIRE OR CALL . . .

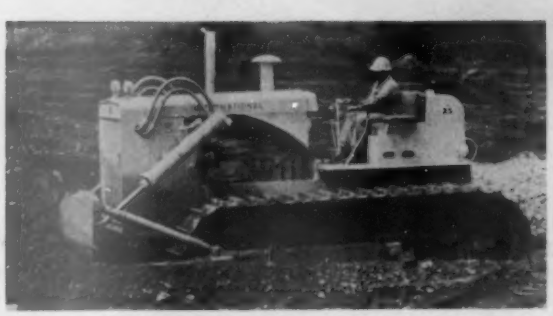
FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Branches: Houston, Odessa, Olney

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .



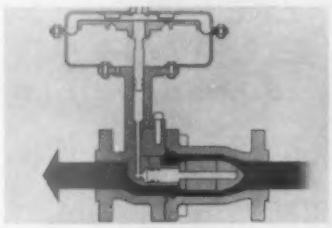
Diesel tractor delivers 230 hp. net

. . . at the flywheel at 1,500 r.p.m. The purchaser has a choice of either a torque converter or greater drive on the Model TD-25 tractor. The torque-converter model sells for $33,725 and the gear-driven model for $31,490 f.o.b. factory. They're both available for immediate delivery.

Features of the torque-converter model include four forward speeds and reverse. Drawbar pull ranges up to 70,000 lb. at 0.75 m.p.h. Operating weight is 46,000 lb.

Features of the gear-drive model include eight forward speeds and reverse. Drawbar pull is 46,600 lb. in first gear at rated governed speed. Operating weight is 45,500 lb.

Both models have a Planet-Power system that permits the operator to turn the tractor with controlled power on both tracks with finger-tip steering. This permits the fully loaded tractor to turn smoothly, under positive control, whether working upgrade, downgrade, or on the level. Source: **International Harvester Co., 180 North Michigan Avenue, Chicago 1.**



Gas regulator keeps turbulence low

. . . as its designed to maintain straight-through or laminar flow. The Jet Stream pressure-reducing gas regulator is suited for gas and liquid pipelines and process plants. The unit was designed to eliminate jetting of high-velocity gas and transient particles into the side of the regulator, often a major cause of failure in conventional regulators. The straight-through flow also reduces sound vibration.

A hydraulically actuated slave piston is used to regulate flow with fine control. The maker says the regulator can be regulated from full flow to bubble-tight shutoff in 3 seconds. The expansion type of pneumatic-hydraulic operated regulator has conventional controls. A diaphragm motor serves as the actuating power source. Regulator flow is controlled by compression of a solid-rubber cylinder by the slave piston acting against a movable slotted baffle.

The regulator comes in sizes from 1 to 4 in. in flanged, threaded, and insert models. Field-tested by at least 11 pipeline companies, the unit is available for pressures to 1,420 psi. and temperatures to 150° F. Delivery time is 1 to 4 weeks. Price of a 2-in. size is about $315. Price of a 1-in. size is about $180. At 500 psi., the 1-in. handles 370,000 s.c.f. per hour and the 2-in. handles 940,000 s.c.f. per hour. Source: **Apco, Div. of Textron, Inc., 616 West Whittier Boulevard, Whittier, Calif.**

●

New casing protector goes on fast

. . . through the use of a locking pin. The Grip-Lok protector is made of synthetic rubber bonded to a hinged steel inner cage to form a series of interlocking faces at the latching ends. The locking pin drops through the compound hinge element to hold the protector securely to the drill pipe.

The maker claims one man can install or remove the protector in less than 10 seconds. He needs only two

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

.....

Described in OIL AND GAS JOURNAL - Issue of **November 16, 1959**

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

Three men can lay 4,000 feet of 4" pipe of Tenite Butyrate in one working day.

The light weight of pipe of Tenite Butyrate eases handling and distribution.

Butyrate plastic pipe is *inherently* corrosion resistant

A pipe with "built-in" protection against corrosion

Corrosion has always been a major problem in the petroleum industry. For nearly ten years, however, more and more oilmen have been specifying pipe made of Tenite Butyrate plastic to relieve this problem.

With pipe of Tenite Butyrate, corrosion worries are all but forgotten. This pipe, by its very nature, withstands the corrosive effects of sour crudes, salt water, and alkali soils. It gives year after year of worry-free service.

Pipe of Tenite Butyrate has other important advantages, too. Installation time and labor are minimized because this pipe is approximately 20% the weight of metal pipe of the same diameter, and is easily handled and transported. It is cut with a hand saw and joined quickly by solvent-welding. The smooth walls of pipe of Tenite Butyrate give up to 40% greater flow volume than does metal pipe for the same head loss. In addition, these glistening walls resist the accumulation of paraffin. All of these advantages produce substantial savings for users.

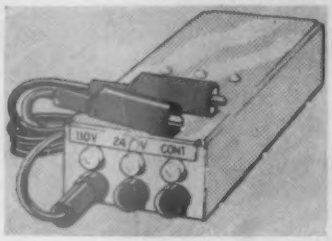
For more information plus names of companies producing Butyrate pipe and a complete range of fittings, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENN.

TENITE
BUTYRATE
an Eastman plastic

A 16mm. sound-color film, "Plastic Pipelines," is available upon request.

tools—one for installation and one for pulling out the pin. The 5-in.-long protector comes for 2⅞ to 5½-in. drill pipe. Source: **Byron Jackson Tools, Inc., Box 2017A-Terminal Annex, Los Angeles 54.**

●



Circuit tester fits in pocket

. . . providing a convenient yet reliable method for determining if power is available and if wiring hookups are continuous. Power availability and continuity for any normal voltage circuit can be instantly noted through the three top-located indicator lights.

The Model AT-101 tester is powered with two C-type flashlight batteries. The bulbs are a miniature bayonet-base type. Weighing only 12 oz., the tester measures 4¼ in. long, 2¼ in. wide, and 1¼ in. thick. It thus easily slips into a shirt or coat pocket. It sells for about $7. Source: **Autotron, Inc., Box 2278, Santa Monica, Calif.**

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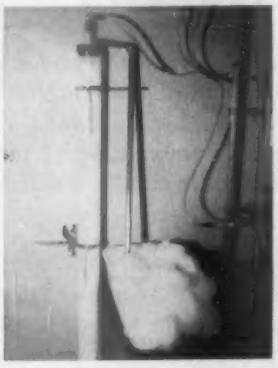


Two new aids to air drilling

. . . have been disclosed. One is a foaming agent, Howco Suds, or water-soluble surfactant that imparts a low surface tension to water. It is capable of producing large volumes of foam under various conditions, the maker says.

As a foaming agent, it can be used to regain return of balled cuttings and to give continuous foaming action during drilling. In water-injection wells, it can aid in dispersing injection-plugging silt and clays by loosening and removing solids. Added to fracturing water, it aids in recovery of water.

The other product is Howco-Sorb, a powder which has six to eight times the absorbing abilities of similar materials. The maker says it can absorb water up to four times its weight and still remain a l o o s e, free-flowing powder. It can be used to dry wet holes after water shutoff is accomplished and to permit prompt resumption of dry drilling. After slugging to remove accumulated water, it can be used further as drilling dust when water production is not excessive. Source: **Halliburton Oil Well Cementing Co., Duncan, Okla.**

Highly effective antiknock compound

. . . recently developed combines lead and manganese. The TEL Motor 33 Mix consists essentially of a mixture of tetraethyl lead and methylcyclopentadienyl manganese tricarbonyl. The maker says, in fuels in which it is most responsive, it will provide octane numbers at a lower cost than is available either from TEL alone or from refinery processes. Too, it will contribute to higher gasoline yields and better use of various refinery streams. Source: **Ethyl Corp., 100 Park Avenue, New York 17.**

HYDROSTATIC PIPELINE TESTING

EXPERIENCE MAKES THE DIFFERENCE

. . . and a world of experience in testing thousands of miles of pipelines makes the difference in every Williams testing job.

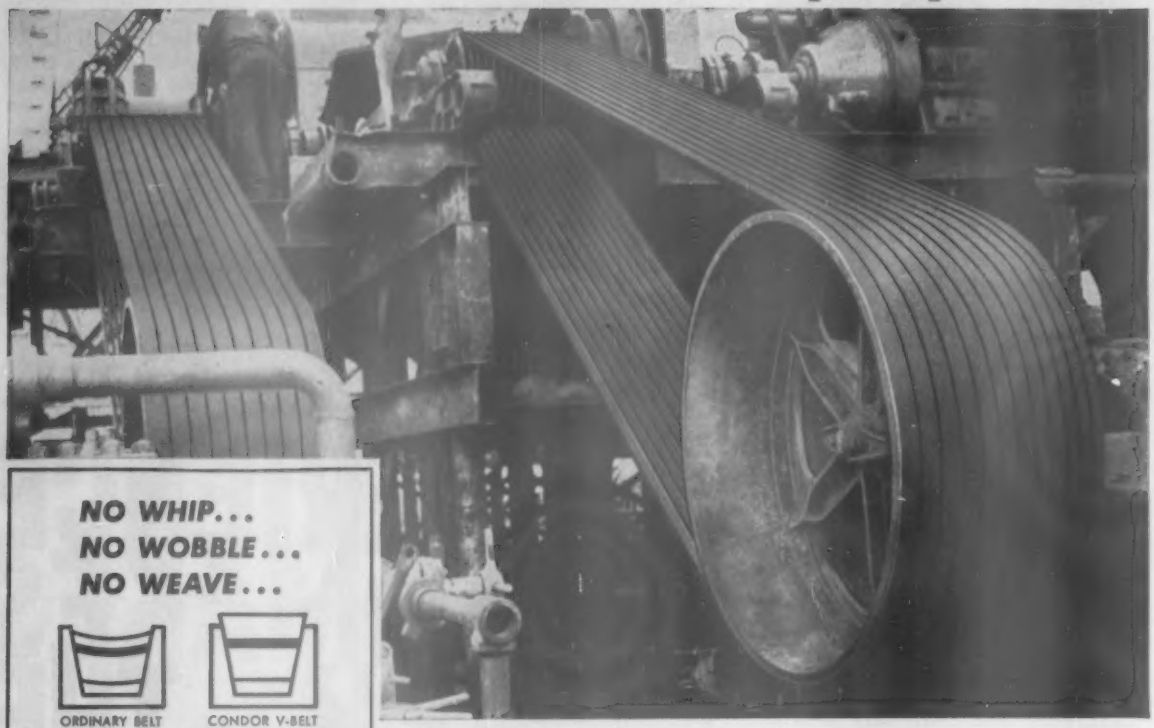
Williams
PRESSURE SERVICE COMPANY

Call Shreveport 4-2678

2000 BECK BUILDING
SHREVEPORT, LOUISIANA

SPECIALLY DEVELOPED EQUIPMENT • COMPLETE TESTING SERVICE
EXPERIENCED TESTING ENGINEERS

Wherever oil men work, they depend on



NO WHIP...
NO WOBBLE...
NO WEAVE...

ORDINARY BELT CONDOR V-BELT

Note how flat sidewalls in Condor at right prevent sag in "power line".

CONDOR LS V-BELTS COME MATCHED TO STAY!

Top to bottom, *every* part of a Condor LS Belt is "length stabilized" ...engineered to minimize belt stretch and eliminate whip and turnover that leads to belt failure.

- **New "Stabilizing" Section**
- **Repositioned Belt Strength Members**
- **Length Stability *Without* Stretch**
- **Smoother, Cooler Running**

Plus

- **Moisture-Proof Vacuum Packaging**

Each Section C and D long-center belt is measured under controlled humidity . . . length certified and tagged . . . then vacuum-sealed in aluminum-lined, moisture-proof bags. Result? Factory-fresh belts—positive matching—no shrinkage or elongation in storage . . . sustained uniformity on your drive!

Write for Bulletin #M210

..."MORE USE PER DOLLAR"

THESE CONDOR LS* V-BELTS ARE DELIVERING 40% MORE HP

Continued improvements in Raybestos-Manhattan's Condor V-Belt over the years have resulted in an engineering advance of major importance to users of long-center V-belts. The Condor LS V-Belts you install today have the 40% greater power capacity formerly available only in a *premium* V-belt construction . . . *without* the premium price!

R/M engineering utilizes special super-strength synthetic fabric strength members in Condor LS V-Belts. Micro-positioned in special heat dissipating rubber and with flat sidewalls, they make possible an average of 40% more power capacity and longer life . . . assure a smoother, cooler running drive even under shock loads.

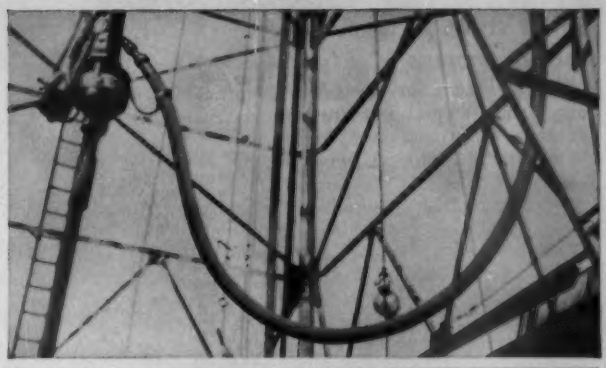
Chances are the Condor LS V-Belts in your inventory have this 40% reserve power capacity. Be certain the *next* belts you buy are Condor LS V-Belts . . . the premium V-belt construction at the standard V-belt price.

R/M

OTHER RUBBER PRODUCTS FOR THE PETROLEUM INDUSTRY

MUD PUMP INTAKE HOSE • VIBRATION HOSE • SHIP AND BARGE LOADING HOSE • TANK TRUCK AND TANK CAR HOSE • PROPANE HOSE • FUEL OIL TRUCK HOSE • FIRE HOSE

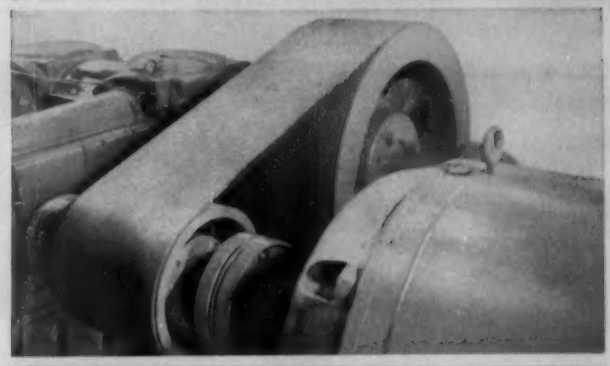
R/M Products



RAY-MAN ROTARY HOSE

Strong • Safe • Flexible

Special high-tensile steel cable wire reinforcement, precision wound under tension, gives Ray-Man CBL Rotary Hose unequalled strength and flexibility for safer, easier handling and make-up on the rig. Resists kinking and accidental crushing in transport . . . holds steadier in the derrick *without whipping*—even under high pressures of deep drilling. Streamlined, built-in coupling has no protruding lugs or flanges—features R/M leak-proof "Lip-Lok" seal that tightens under pressure to prevent blowouts! Write for Oilfield Hose Bulletin M651.

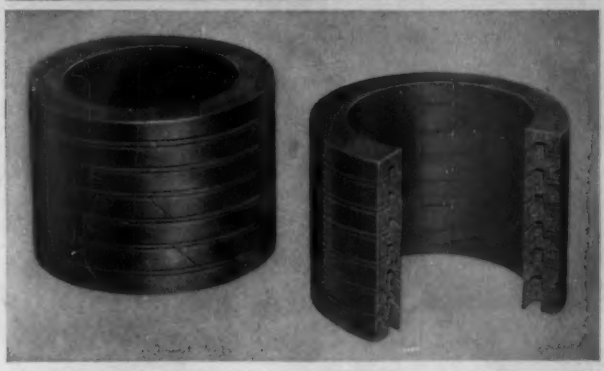


R/M POLY-V® DRIVES

More Power • Less Space

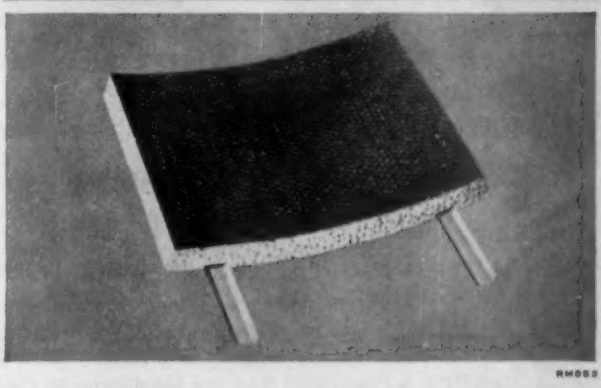
No other drive puts as much extra push in deep hole drilling as the exclusive, patented R/M Poly-V! Delivers up to 50% more power capacity than a V-drive of equal width . . . or equal power in as little as ⅔ the width. Single unit belt design eliminates belt matching problems in the field . . . reduces field inventories. Just *two* belt cross sections meet every heavy duty drive requirement. Write for Poly-V* Drive Bulletin M141.

**Poly-V is a registered Raybestos-Manhattan trademark. Patented.*



R/M VEE-SQUARE® PACKINGS FOR MUD PUMPS

Depend on R/M Vee-Square Packings for extra reliability. Nonyielding, they can take tight gland pressure, require no sensitive gland adjustments. Blow-by is prevented by soft rubber cushions between the rings, and they seal automatically. R/M "Vee-Square" packing is manufactured for all types and sizes of oilfield mud pumps. Write for Hydraulic Packings Booklet.



RAY-MAN BRAKE BLOCKS

Long lasting Ray-Man 635-D Brake Blocks cost less because they wear longer. Made of extra-large asbestos yarns, special saturant, wire reinforced. Resist bleeding, won't glaze or carbonize. Ray-Man blocks are available in drilled or countersunk sets or in the R/M patented Key-Lok style. Patented key-lok gives more friction surface, blocks slide on and off to speed relining. Make hole faster. Cut cost with Ray-Man. Call your nearest R/M warehouse today or contact your closest authorized R/M oilfield equipment supply store located in major oil producing areas.

RM053

RAYBESTOS-MANHATTAN, INC.

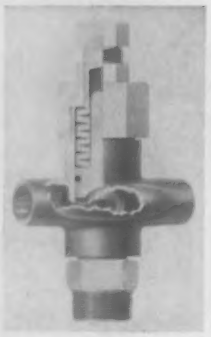
PASSAIC, NEW JERSEY

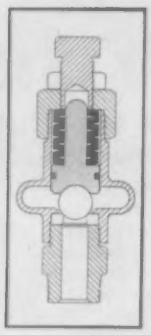
Brake Lining and Blocks • Clutch Facings and Automatic Transmission Friction Parts • Conveyor and Power Transmission Belts Industrial Hose • Rubber Covered and Lined Equipment • Mechanical Packings and Gasket Materials • Asbestos Textiles • Engineered Plastics • Sintered Metal Products • Abrasive and Diamond Wheels • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

Relief valve protects surface pumps

. . . where excessive pressure buildup may occur. To prevent corrosion, particularly in water-flood service, the body and seat retainer are made of aluminum bronze.

Schnor disk type of springs are used instead of the conventional coil spring. Permanent set is practically eliminated. Each leaf of the spring is capable of withstanding the maximum pressure of the valve. This system of springs is highly sensitive, especially near the top range of the valve. The





field tested relief valve comes in two sizes—1 and 2-in. The 2-in. model has an adjustable range from 0 to 3,000 psi. The 1-in. model has a range from 0 to 1,000 psi. Source: **Baird Mfg. Co., Box 380, Tulsa.**

●

Compact flowmeter manifold produced

. . . that is equivalent to the conventional five-valve manifold and contains two main line shutoff valves, a double-block equalizer valve, and an atmospheric vent valve in a single, compact barstock body.

Valve seats are soft and replaceable. The Model M6C manifold is lightweight and available in carbon steel as well as stainless steel on special order. It is rated at 5,000 psig. and 200° F. Source: **Anderson, Greenwood & Co., 5425 North Rice Avenue, Houston 36.**

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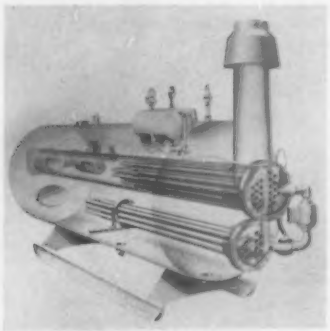


Packaged gas-fired water heater

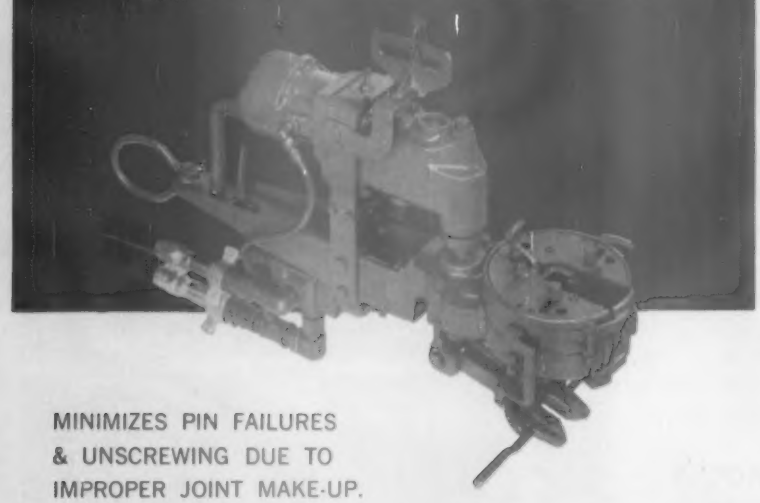
. . . just developed combines indirect firing with large-volume heating of service water. The self-contained package includes electronic controls for automatic operation without the need for weekly or monthly inspection or attention. Basically the unit comprises three closely integrated systems—a gas

The MODERN way to make-up sucker rods

HILLMAN-KELLEY

Hydraulic Power

SUCKER ROD WRENCH



MINIMIZES PIN FAILURES & UNSCREWING DUE TO IMPROPER JOINT MAKE-UP.

ASSURES ACCURATE MAKE-UP AS RECOMMENDED BY THE A. P. I. TASK GROUP ON SUCKER ROD JOINT MAKE-UP.

ELIMINATES HAMMERING ON SUCKER ROD COUPLINGS.

HILLMAN-KELLEY

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OTHER H-K POWER EQUIPMENT:

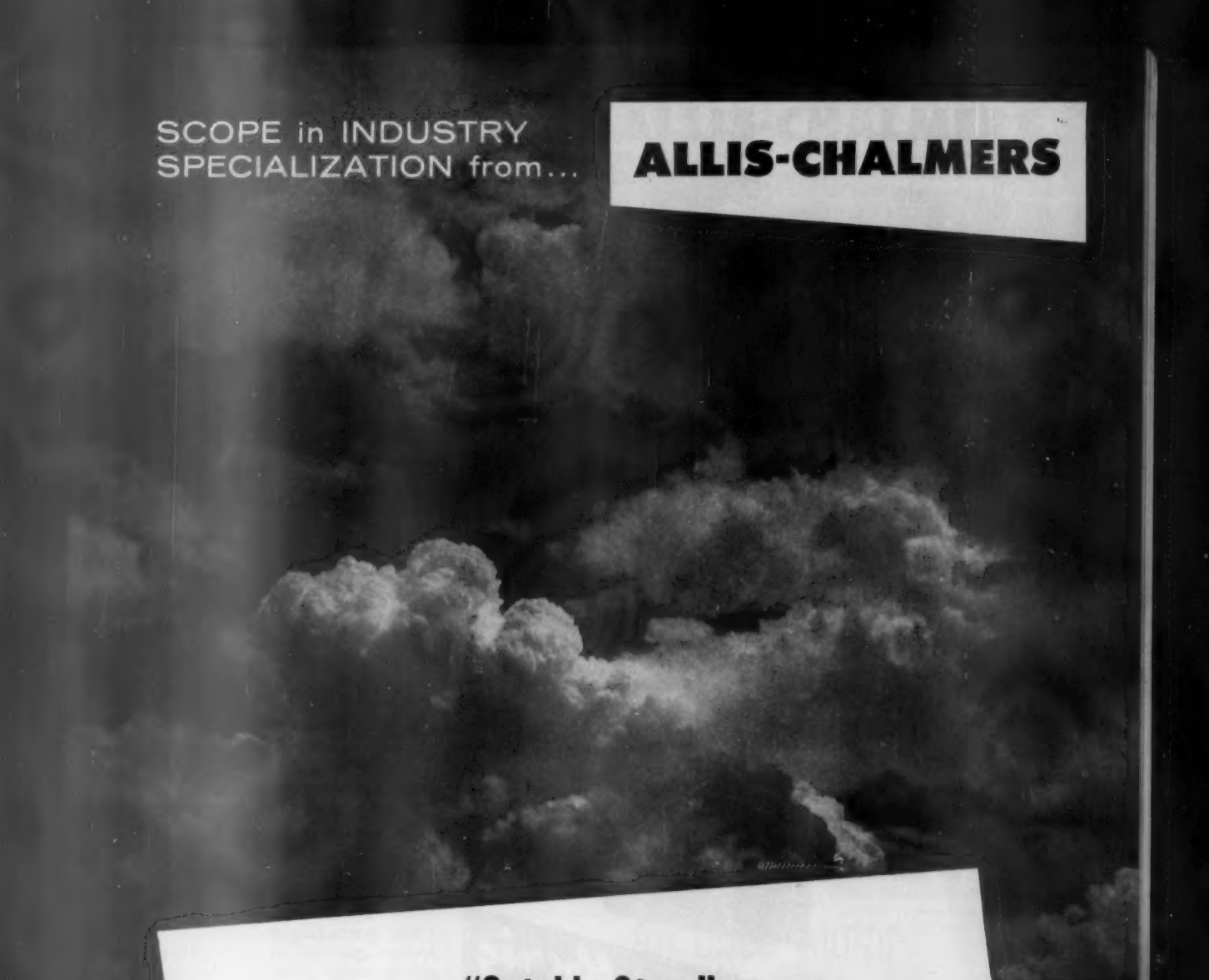
TUBING TONGS • CASING TONGS • POWER UNITS

MID-CONTINENT REPRESENTATIVE FOR:

ADVANCE POWER OPERATED TUBING SPIDER

SCOPE in INDUSTRY
SPECIALIZATION from...

ALLIS-CHALMERS



an "Outside Story" about Allis-Chalmers products

Self-protection against weather is built into a variety of Allis-Chalmers products — electrical or mechanical. This "Outside Story" through a broad range of A-C equipment (and only A-C offers such a scope of outdoor products) *eliminates the need for costly protective enclosures in many operations.*

Pumps, motors, compressors, mechanical drive equipment, control and switchgear with inspection alleys — all are designed to perform 'round the calendar while exposed to the elements.

For single-source availability of a tremendous scope of up-to-date equipment, designed for outstanding quality control, contact your A-C representative. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Products for Petroleum: Electrical Generation and Distribution Equipment; Pumps (rotary vacuum and centrifugal); Compressors; Motors and Control; Mechanical Power Transmission Equipment; Water Conditioning Systems, plus Materials Handling Equipment.

A-C ALLIS-CHALMERS

A-5917-P

burner, forced-circulation heat-transfer fluid system, and shell section.

Tradenamed the Scalefree heater, the unit is factory-wired and insulated with a metal jacket. All water-heating surfaces are of copper. Surfaces inside the steel storage section can be lined with copper or a low-soluble cement. Source: **Patterson-Kelly Co., Inc., East Stroudsburg, Pa.**

●

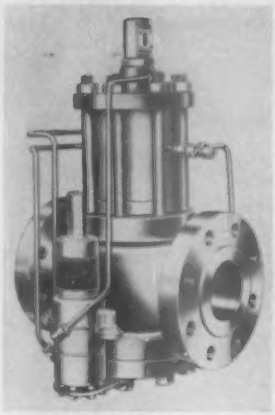
New bearing material for pumps

. . . used in submersible seawater pumping lasts more than three times as long as equivalent metal bearings in fluids that are highly corrosive and erosive, the maker says. The Vanco material has excellent resistance to acids, alkalis, and other chemically strong fluids. The material comes in either tubular or solid rod form in diameters of ½ to 9 in. and in 14-in. increments. Source: **Van's Products Co., 8570 Hays Street, Culver City, Calif.**

●

Gas regulator shuts off tightly

. . . at a 1,000-psi. pressure drop. Piston-operated, the Type 403 regulator gives a wide range of flow control.



Features include composition disks and a high-pressure pilot suited for town-border stations, compressor stations, and other installations where high pressure drops and wide flow ranges are met.

The regulator has been field-tested on pipelines and at booster stations. It comes in sizes from 1 to 6 in. with screwed or flanged ends. Price varies with size and body materials. A 2-in. size with a steel body and screwed end sells for about $430. Delivery time is about 4 to 5 weeks. Source: **Fisher Governor Co., Marshalltown, Iowa.**

●

New petroleum refining process

. . . is now available for licensing. Called Isocracking, the process manufactures gasolines of unusually high octane number from low-grade petroleum fractions, according to the developer. It thus promises to permit refiners to take marginal stocks formerly difficult to refine efficiently and convert them into superior quality products. The process uses low temperature and pressure in conventional types of equipment.

Typical feeds for the process are heavy-cracked naphthas, light-cycle oils, and coker distillates. A typical product is gasoline blend stock, which after moderate reforming, has a research octane rating of 103 to 105 F-1 with 3 ml. of TEL. Yields of this quality gasoline generally exceed 100% volume. Additionally, a substantial volume of isobutane is produced.

The on-plot cost of an Isocracker unit is estimated to range from $350 to $450 per daily barrel of reactor feed. The plant operates with a high per pass conversion in the range of 50 to 70%. Source: **California Research Corp., 225 Bush Street, San Francisco 20.**

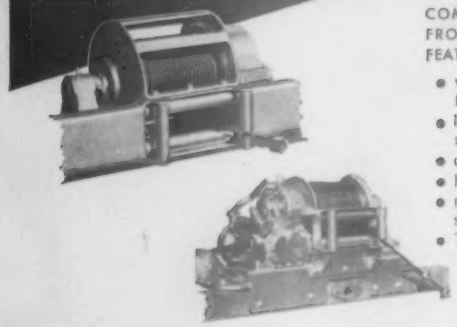
KING WINCHES

. . . for 'Jeep' vehicles, International*, Chevrolet, GMC, Ford, Land Rover and others.

COMPLETE, READY-TO-INSTALL KING FRONT-MOUNT WINCH ASSEMBLIES FEATURE:

- winch side arms to reinforce truck frame
- bronze-bushed, 4-way cable guide rollers
- cable drum guard
- heavy-duty pipe bumper
- needle-bearing, universal-joint spline-shaft drive assembly
- Timken bearings on worm

King Winches for International trucks are available through International-Harvester dealers.



King Winches keep you moving through the most difficult terrain . . . you get action where there's no traction with dependable pulling power. King power winches have pulling capacities of 8,000 to 19,000 lbs.

Koenig

ALL-STEEL CABS FOR 'Jeep' UNIVERSALS

FULL AND HALF CABS

Model 550 Koenig Full Cab and Model 151J King Winch on CJ-5 'Jeep' Universal.

Koenig cabs and King Winches for 'Jeep' vehicles are available through all authorized 'Jeep' vehicle dealers. Write for free descriptive literature.

KOENIG ALL-STEEL CABS HAVE THESE SUPERIOR FEATURES:

- PROTECTION
- SAFETY
- COMFORT
- CONVENIENCE

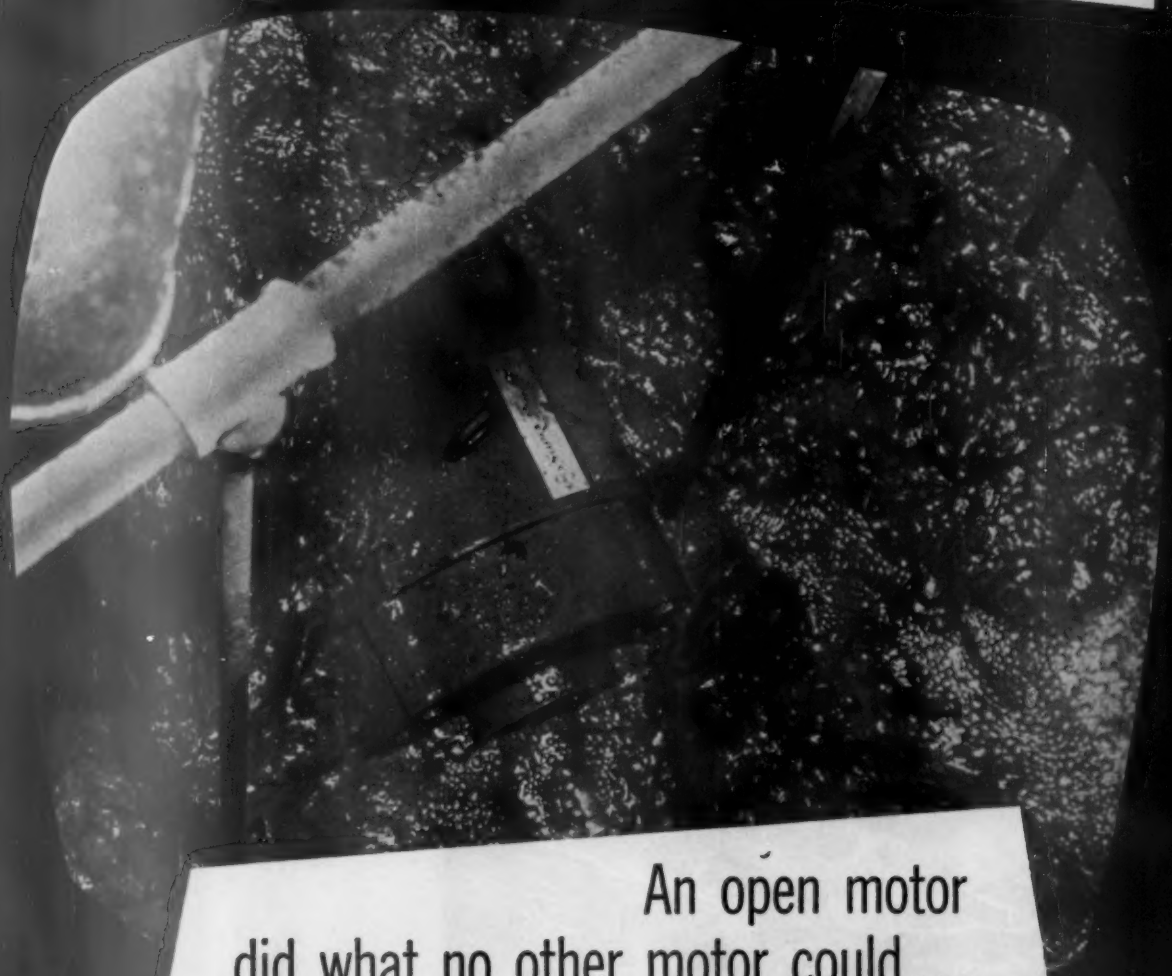
Roll-down windows, full opening . . . full panelboard head lining and masonite door lining . . . safety glass throughout . . . all-steel welded construction . . . door locks.

IRON WORKS, Inc.

P. O. BOX 7726 • HOUSTON 7, TEXAS

SCOPE in MOTOR DEVELOPMENT from . . .

ALLIS-CHALMERS



An open motor did what no other motor could . . . in a mudbath

This Super-Seal motor with *Poxeal* insulation and protected bearing was not fouled by mud. An Allis-Chalmers customer, in a frequently flooded area, required a motor that could readily start even after prolonged immersion in mud.

The "dirtiest mud available" was used in conducting the successful tests in the A-C Motor Laboratories.

Motor user requirements like this form the basis for A-C pioneer-leadership in motor development. Motor buyer needs created the most complete line of integral-horsepower motors in industry. Induction, dc, wound-rotor, synchronous, gear, tube-type and *Synduction* motors, and now *Super-Seal* motors! And, if these lines don't fill your need, A-C engineering excels in special design.

Motor users in the petro-chemical industries can benefit from this pioneer-leadership. Contact your A-C representative or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

Super-Seal, Poxeal, and Synduction are Allis-Chalmers trademarks.

A-C ALLIS-CHALMERS

A-1005-C&P

SHOWCASE . . .

New Equipment

Portable vibration meter for field

. . . use is battery-powered, transistorized, and designed to give the range and accuracy previously associated only with laboratory type of instruments. It gives direct readings of velocity, displacement amplitude, and acceleration components of vibration. From a simple computation, you can determine the frequency.

The Model T-1A meter accepts up to six simultaneous transducer outputs. From the function switch, it gives readings of up to 1,000 G acceleration, 0.01 to 100 in. a second velocity, and 0.001 to 10-in. displacement at better than 5% accuracy over-all. Available for immediate delivery, it sells for about $475. Source: **Southwestern Industrial Electronics Co., Box 13058, Houston 19.**

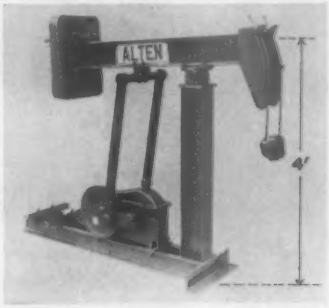
●

Newest petroleum-refining process

. . . may provide an inexpensive way to remove harmful sulfur compounds from a wide range of gasoline and light-distillate oils. Called Merox, the process has two major applications. It can be operated to remove mercaptans from gasoline and lower boiling fractions, in which case there is a reduction in the sulfur content of the material treated. It can also be used to sweeten stocks in which extraction is not of interest by converting the mercaptans to disulfides.

Available for immediate licensing by refiners, the process functions through catalytic oxidation of mercaptans to disulfides in a caustic solution at ambient temperatures, using atmospheric oxygen. Disulfides formed are insoluble in the solution. Source: **Universal Oil Products Co., 30 Algonquin Road, Des Plaines, Ill.**

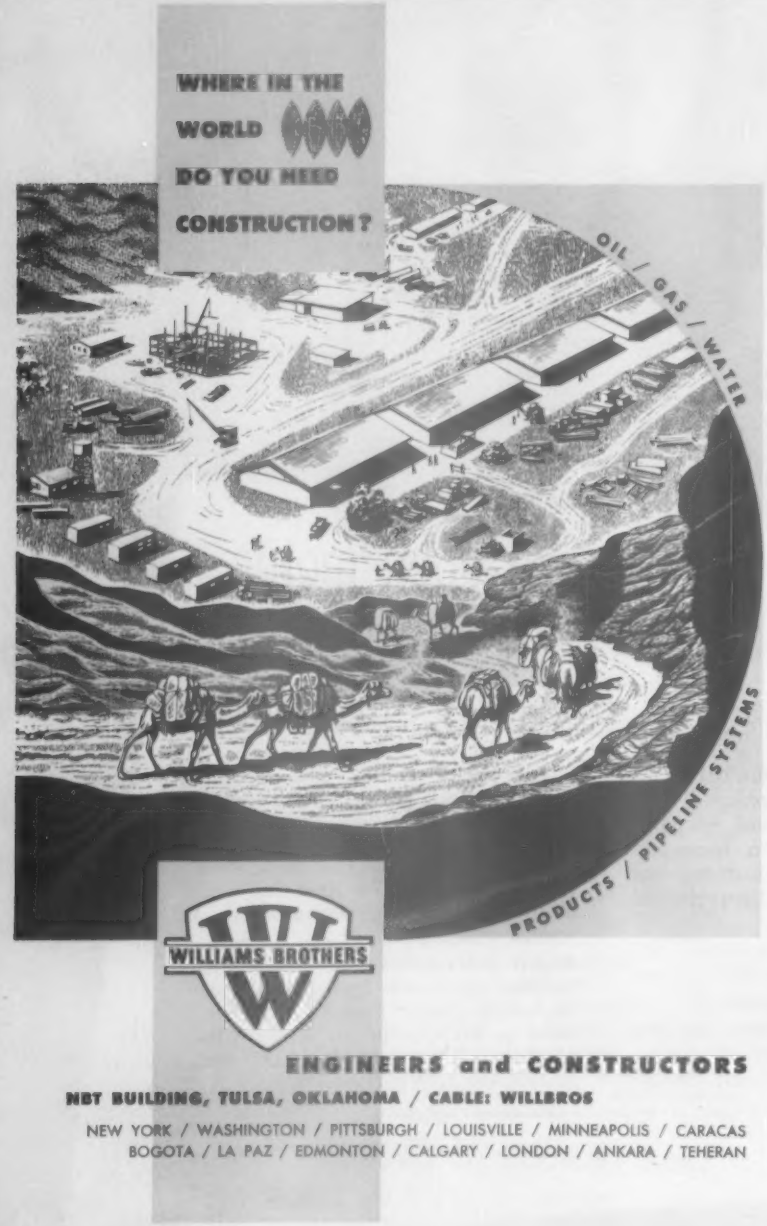
●



Pump unit produces stripper wells

. . . and sells for under $400. Measuring only 4 ft. high, the Pee Wee pumping unit is designed to handle extremely shallow stripper wells.

One important feature of the unit is that the structural bearings are of nonmetalic material to help absorb shock loads and to run a long time between lubrications. The gear reducer is designed to both API and AGMA specifications. Structural rating is 1,500 lb. The gear-reducer rating is 4,600 in.-lb. Stroke length is 12 in. The pumping unit is available from stock. Source: **Alten Foundry & Machine Works, Box 426, Lancaster, Ohio.**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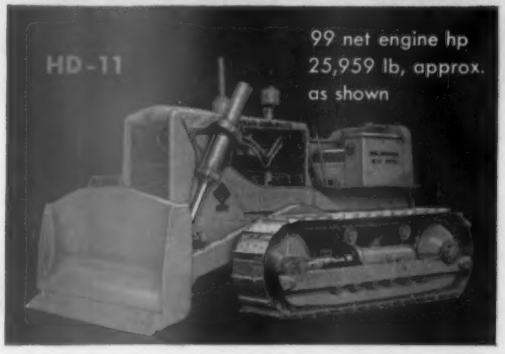
BOGOTA / LA PAZ / EDMONTON / CALGARY / LONDON / ANKARA / TEHERAN

Big, new 8-ft tractor-dozer digs slush pits *FAST*



From the first cut in any soil—rocks, hardpan, tough clay—the Allis-Chalmers HD-11 tractor-dozer moves *more* dirt *faster* than any other 8-footer you can buy. You've got a 13-ton tractor-dozer here, with 22,000 lb of *live push* behind the blade.

Down in the hole, the HD-11's wide tread and track give you excellent stability. Tremendous structural strength—with the only complete box-A frame available—enables the HD-11 to take the worst shocks of heavy dozing in stride.

Up and out of the steepest slush pit grade with a full-blade load—here's where superior over-all balance pays off. The HD-11's weight is distributed for best end-to-end balance and for maximum traction and flotation.

Your Allis-Chalmers dealer can give you a stop watch demonstration of the HD-11 in action. He's ready to prove how this machine can dig a slush pit faster than any other 8-ft tractor-dozer on the market . . . handle other tough oil field pulling, winching and pushing jobs with equal efficiency. Allis-Chalmers Construction Machinery Division, Milwaukee 1, Wisconsin.

New inside push-beam tractor-dozer designed and built by Allis-Chalmers as a matched unit. Portable without over-width highway permit.

...move ahead with **ALLIS-CHALMERS**

...power for a growing world

THE 69½ FEET THAT REACH THE MOON

From a hole no deeper than that, drilled in Pennsylvania 100 years ago, have come endless miracles of oil.

Today, petroleum gives us fuels that are capable of moving man from earth to the moon and beyond. Such explorations can bring new knowledge of incalculable value.

But no less certain than that we will one day fly through space is that we will have ever better fuels and lubricants for travel on the ground, on the sea and in the air – new and exciting products for the farm, industry and the home.

Today one quarter of all the money spent by U.S. industry on research is spent by the petroleum industry.

And as chemists study the endless ways to re-arrange oil molecules to make useful products, we can see that the age of petroleum has only begun.

Standard Oil Company (New Jersey) Esso

OIL'S FIRST CENTURY
BORN IN FREEDOM
WORKING FOR PROGRESS

a seismic crew
is only as good as
its personnel

MEET
DEXTER
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(an oil finder)

One of many
able Petty
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With more than 26 years of continuous service and experience with Petty, Dexter Wright personifies the fact that you can depend on reliable, experienced crews from Petty.

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TRANSIT TOWER SAN ANTONIO CApitol 6-1393
Foreign Experience Since 1927

NEVER CONTENT TO BE "AS GOOD AS"... ALWAYS STRIVING TO BE "BETTER THAN"

SHOWCASE . . .

New Literature

Features of turbine-type pump

. . . are outlined in new eight-page Bulletin S-111. Included are exploded views, selection tables, limitation charts, dimensions, construction specifications, and detailed engineering specifications. The pumps range in capacity up to 150 g.p.m., with pressures to 300 psi., and temperatures to 275° F.

According to the literature, the pumps are adapted to applications such as boiler feed, condensate return, fresh-water service, filter service, caustic liquid handling, LP-gas service, water treatment, transfer service, and booster service. Source: **Aurora Pump Div., New York Air Brake Co., Loucks Street, Aurora, Ill.**

Recommended piping practice

. . . wall chart, now obtainable, is suitable for posting on shop bulletin boards. The three-color, 17 by 22-in. chart should prove useful for installation and maintenance personnel and individuals requisitioning valves of all types.

The chart is divided into five sections—basic valve types, connections normally used, installation and maintenance tools, installation, and operation and maintenance—for easy reference.

Illustrations of valves, engineering specialities, and lubricating devices appear on the back of the chart. Source: **Lunkenheimer Co., Box 360, Annex Station, Cincinnati 14.**

Spray-type deaerating heaters

. . . are detailed in new Bulletin WC-101C which discusses aspects of the process and equipment, principles of deaeration, deaerator operation, standard designs available, design features, and accessory equipment. The eight-page publication is illustrated with numerous drawings and photographs. Source: **Graver Water Conditioning Co., 216 West Fourteenth Street, New York 11.**

Chemical-export products list

. . . contains brief descriptions, physical data, uses, and packaging information on 31 chemicals.

Products are: benzoic acid, benzoyl chloride, caprylyl chloride, carbonate

Naugatuck KRALASTIC®
Rubber-Resin

Installation of KRALASTIC pipe manufactured by Plastic Pipe Division, Triangle Conduit & Cable Co., Inc.

Whole sections are easily prefabricated and carried to site.

Solvent welding speeds and simplifies connections.

Now Kralastic reduces radiant heating costs

PROVED FOR 8 YEARS—1½ MILLION FEET IN USE

KRALASTIC®—the plastic pipe material that has proved so superior in dozens of piping applications—has now made it possible to reduce overall radiant heating costs by an average of 25%...as much as 25 cents a square foot!

Thoroughly approved by all who have worked with it, including architects, heating engineers, and contractors, KRALASTIC has made radiant heating practical for home buyers and builders everywhere by providing such advantages as these:

- Lower cost than any metallic coil material on the market
- Lightweight toughness that allows whole grid sections to be prefabricated in the shop
- Solvent welding for quick, sure joining on the job
- No need for special expansion joints as with other materials
- Exceptional resistance to clogging
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- Compatibility with standard radiant heating designs and techniques

The more than 145 installations of KRALASTIC for radiant heating give evidence of the advantages you can expect in KRALASTIC pipe for potable water supplies, chemical piping, electrical conduit, waste disposal, applications by the hundreds. Learn first hand the proved advantages this tough rubber-resin material offers you. For further information on KRALASTIC pipe, for expert technical assistance with any product application, contact us today.

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There's no paint on Lufkin Chrome Clad "Atlas" Oil Gaging tape lines.

The bold, black markings are bonded to the basic metal . . . protected with several electroplatings that give extra strength to the line. The final metal coat is Lufkin's exclusive Chrome Clad finish. Glare-free, smooth, rust resistant . . . the most durable tape line you can buy.

It's 50% heavier *than standard-weight steel tapes. Shows oil level clearly. Wipes clean easily. In lengths from 18 to 100 feet.*

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PURIFIER CHALK TALK #13

SCREEN-FREE, FILTER-FREE STATIONARY ELEMENT

How to eliminate gas scrubber maintenance

Gas scrubbers that require filters, mesh screens or moving parts are costly maintenance devices. To prevent clogging and fouling, their filters, screens or moving parts must be cleaned periodically. Today, however, separation can be accomplished with little or no maintenance. Hi-eF Purifiers have neither filters, screens or moving parts. . . eliminate operating costs completely. Send for Bulletin 803.

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PURIFIERS . . . SEPARATORS . . . SCRUBBERS

of potash, caustic potash, caustic soda, chlorinated paraffin, para-dichlorobenzene, Fluorolubes, Het acid, hexachlorocyclopentadiene, lauryl mercaptan, lauryl pyridinium chloride, oxalic acid, phosphoric acids, phosphorous pentasulfide, piperidine, potassium chlorate, sodium benzoate, sodium chlorate, sodium hexametaphosphate, sodium sulfhydrate, sodium sulfide, sodium tetrasulfide, sodium tripolyphosphate, tetrachlorphothalic anhydride, tetrasodium pyrophosphate, thionyl chloride, trichlorethylene, trisodium phosphate, and zinc phosphide. Source: **Hooker Chemical Corp., Box 344, Niagara Falls, N. Y.**

Scientific and test instruments

. . . Catalog G-10, yours for the asking, offers 52 pages of descriptions, illustrations, salient specifications, and reference for additional information for each family of instruments.

The catalog deals with d.c. amplifiers, data-handling systems, lab and calibration instruments, magnetic-tape instrumentation, nuclear instrumentation, oscillographs, recorders and indicators, servo components, temperature controllers, and transducers. Source: **Minneapolis-Honeywell Regulator Co., Station M-321, Wayne and Windrim Avenues, Philadelphia 44.**

60-page equipment catalog

. . . features hundreds of newly manufactured and surplus industrial items. Special sections are devoted to hydraulic equipment, construction, and the diesel field. More than 2 years were spent in preparing the catalog. Every item is illustrated and described with engineering specifications, technical drawings, and suggested usages. Source: **Groban Supply Co., Dept. P, 1139 South Wabash Avenue, Chicago 5.**

Bulletin discusses recirculated gas

. . . method for obtaining the proper proportioning of heat within a steam generator. Available in a new 16-page form, Bulletin G-96 defines recirculated gas as the process by which gas from the boiler, enonomizer, or air-heater outlet is reintroduced to the furnace by means of a suitable fan and ducts.

The publication discusses the thermodynamic effect of recirculated gas, the mixing of recirculated gas with combustion gas, and its application to boiler design and operation. A number of line and bar graphs and boiler drawings supplement the text. Source:

SEVEN DECADES

of CB&I Craftsmanship in Steel

THE EVOLUTION OF THE OIL STORAGE TANK

from Titusville to T-1 steel . . .

THE BIRTH of the petroleum industry dates back to August 27, 1859, when William A. "Uncle Billy" Smith and his sons drilled Colonel Drake's discovery well on the banks of Oil Creek, near Titusville, Pennsylvania. Since that time oil men have been faced with the problem of how to store the oil they take from the ground. In the early days ordinary wooden barrels were used and if barrels were not available, shallow pits were dug in the earth to serve as makeshift reservoirs.

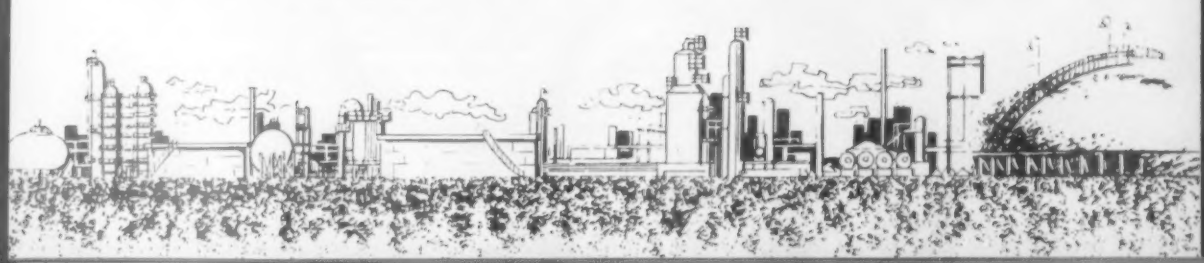
No one worried much about losses from leaks and spillage because oil was plentiful. Evaporation was of little concern because the production of the early refineries was limited to kerosene and crude lubricating oils. Fire, of course, was a menace, but was regarded by oil men as a necessary evil. Cannons were used to blast holes in flaming tanks to permit oil to flow into retaining dikes.

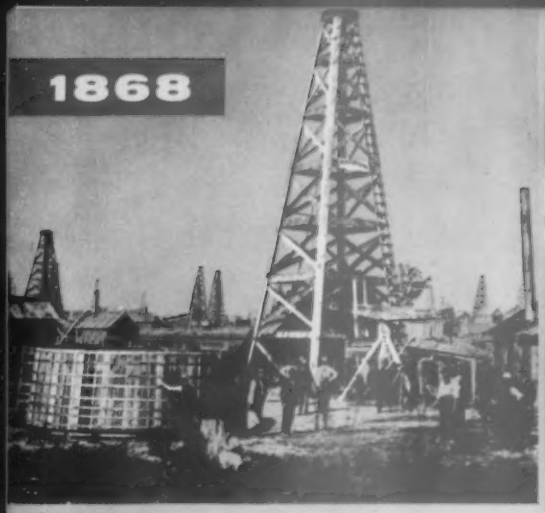
But the time came when barrels and earthen reservoirs could not cope with the rising flood of oil that gushed from Pennsylvania wells. Fears were even entertained that the supply would be exhausted if something were not done to prevent the waste.

Frantically the industry turned to building the first storage tanks which were nothing more than overgrown barrels, standing upright. Some were equipped with roofs and others were left open.

As oil production continued to increase, still larger and better tanks were needed. In September, 1864, *The Derrick* newspaper reported, "Gaff Hasson and Company have erected one large iron tank of an estimated capacity of 8,000 barrels and intend to erect two more of the same size at Oil City, Pennsylvania. These tanks are intended to hold crude petroleum and will be covered with gravel roofs and secured from fire or leakage."

more .....



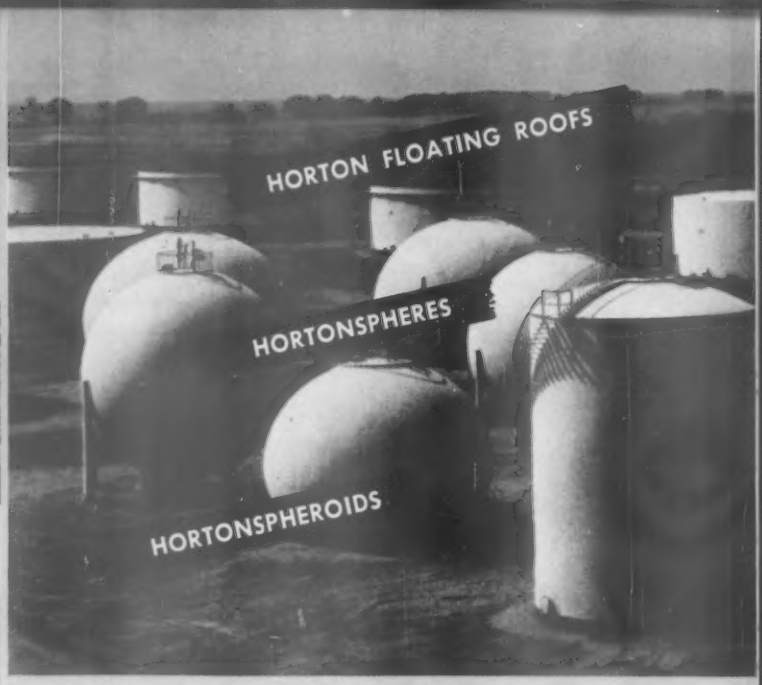


This view shows the Hess Farm wells at Cherry Tree Run, Pennsylvania in 1868. The *wooden storage tank* at the left is nothing more than an overgrown barrel.

The first *Hortonspheres*, shown above, were built in 1923. They were used for liquid storage at Port Arthur, Texas.

These 30-foot diameter by 15-foot high pontoon *floating roofs* were built at Wood River, Illinois, in 1930.

25,000-barrel *Hemispheroid* designed for 2½ pounds per square inch pressure.



A few of the wide variety of storage structures built by Chicago Bridge & Iron Company.

STEEL TANKS

When the production of steel plate was started late in the 19th Century, the petroleum industry turned to tanks of bolted and riveted construction and the maximum size was increased to about 35,000 barrels. Around 1915, many 55,000-barrel tanks were built, and in 1919, the first 80,000-barrel tank was constructed. Today, CB&I welded steel tanks are available in sizes from 170 barrels to 332,000 barrels, with diameters from 10 to 220 feet.

EARLY CONSTRUCTION

In the early days bare electrodes were used in the welding process. It was almost impossible to control the weld, and the variance in the strength and toughness of joints made welding undesirable for stressed joints.

Starting around 1920, it became standard practice to weld tank roofs and bottoms, as they are not required to take calculated stress. It was the introduction of the electric shielded arc process in the early 1930's which resulted in quality that permitted the first welding of entire tanks.

At first, the welding of complete structures was limited by the availability of current or portable generating equipment and, to some extent, by weather conditions. The constant improvement in electrodes, technique and equipment, however, has since made it practical to use welded construction at almost any location.

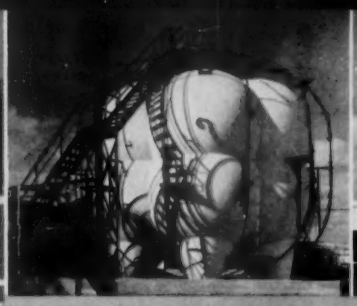
CONSTRUCTION IMPROVEMENTS

Progress in new and more efficient storage structures has been constant. Whereas, years ago one style of tank was used to store all petroleum products, the modern refinery now has a type to do each specific job. These include spherical vessels, spheroidal vessels, cylindrical tanks, flat bottom tanks with floating roofs and vapor-saving roofs.

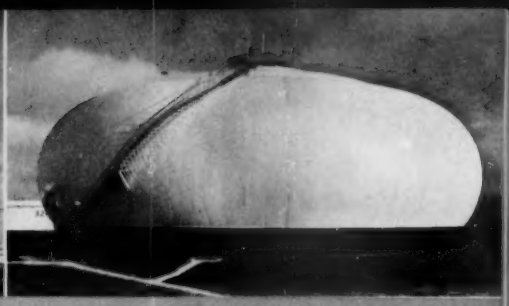
Heavy plates have been replaced by thinner, lighter and stronger plates of steel. Bolts have given way to rivets which in most installations have given way to welds. Strong, yet lightweight T-1 steel has come into common usage with improved fabrication, welding and erection techniques. Similarly, non-corrosive metals and alloys have been put to valuable, specialized usage as linings or in clad construction, utilizing composite metals such as Hortonclad®. The use of aluminum and other non-ferrous metals for tank construction has become more commonplace with improved fabricating and erection techniques.

The wood roofs with gravel or tar surfaces, which covered the tanks in the early '60s, have been replaced with floating roofs which rise and fall with the liquid they protect, or roofs that provide a temporary storage place for the vapors from the tanks in which the liquid is stored.

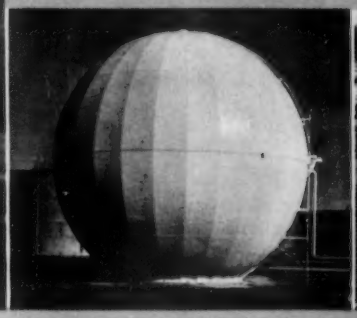
Where there's Refining



2,500-barrel CB&I *Multisphere* stores large volume of methyl chloride under pressure in relatively small space.



80,000-barrel noded-type *Hortonspheroid* used to store gasoline. Designed for 8 pounds per square inch pressure.



The vapor spaces of 18 fixed roof tanks are connected to this 150,000-cubic-foot Horton *Vaporsphere*.

96,000-barrel tank storing gasoline with a Horton *Double-Deck Floating* roof.

EVAPORATION

Almost every major improvement in storage vessels has been directed toward the elimination of evaporation loss and the reduction of fire hazard.

Today, there are three general classifications of containers intended to prevent or reduce evaporation loss—*Liquid* volume change tanks; *Vapor* volume change tanks; and *Pressure* change tanks.

Liquid Volume Change Tanks

These tanks adjust themselves to varying liquid volumes, always keeping their retaining surfaces in contact with the liquid. Tanks equipped with floating roofs are in this group.

Floating roofs are installed in flat-bottom oil storage tanks to reduce evaporation loss, decrease corrosion and eliminate fire hazard. Three types of floating roofs are in general use today—(1) double-deck floating roof, (2) pontoon floating roof, (3) pan floating roof. The first type has a double deck over the entire liquid surface. The second type has an annular pontoon around the outer edge of the roof and a deck of a single thickness at the center. The pan floating roof has a deck of single thickness and a vertical rim at the outer edge. All floating roofs were built with pan-type decks until the pontoon type was developed in 1928. The first tanks with Horton Double-Deck Floating Roofs were built in 1946.

Vapor Volume Change Tanks

These tanks adjust themselves to varying vapor volume, keeping the pressure practically constant. Tanks with vapor-saving roofs come under this classification.

Vapor-saving systems and vapor-saving roofs reduce evaporation loss from standing storage tanks. They provide a variable volume vapor space which allows the air-vapor mixture to expand and contract without venting vapor to the atmosphere. Included in this group are tanks equipped with *lifter roofs*, which move upward during periods of rising temperatures and downward when the temperature falls.

Also in this group are structures equipped with a *flexible membrane* on the inside attached to the steel shell. The flexible membrane raises and lowers instead of the roof. Some are designed to contain liquid in the tank proper and others act as independent units to reduce evaporation loss by storing the vapors from other interconnected cone roof tanks.

Pressure Change Tanks

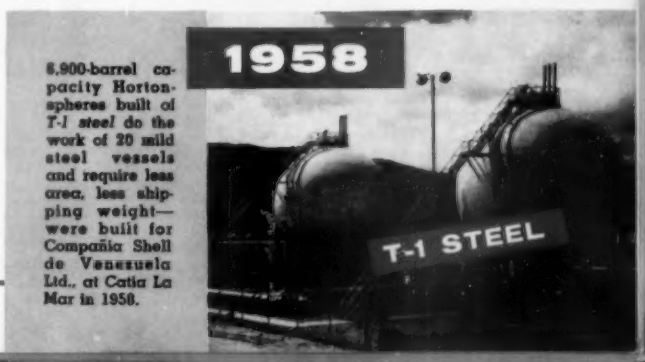
These tanks are designed to keep the combined liquid and vapor volume constant by withstanding internal pressures developed under storage conditions. *Spheroidal, spherical* and *cylindrical pressure* vessels are in this classification. They are effective over large pressure ranges and may be effective for high internal partial vacuums. The first *Hortonspheres* were of riveted construction and were built in 1923 for the storage of liquids at Port Arthur, Texas. Two years later a 57½-foot diameter Hortonsphere was constructed at Phoenix, Arizona, to store gas under pressure.

Since that time Hortonspheres have become a familiar sight in the petroleum industry and today are built as large as 30,000 barrels capacity and 69 feet in diameter for the storage of liquid, and 80 feet in diameter for the storage of gas.

A 225-foot diameter Hortonsphere was completed in 1955 at West Milton, New York, for the Atomic Energy Commission. It is used to house an atomic power plant for U.S. Navy Submarines. Since then, variations of the Hortonsphere and other CB&I structures, have played an important part in the field of reactor housings for practically every major atomic installation.

The first *Hortonspheroid* installation was made in 1929. It was a "smooth" spheroid and had no internal framework. Gradually the design of the smooth spheroid was modified as the demand for greater pressures grew and the noded spheroid, which has internal framing, was developed. Today, the petroleum industry is using Hortonspheroids with capacities of from 2,500 to 100,000 barrels.

...there's CB&I

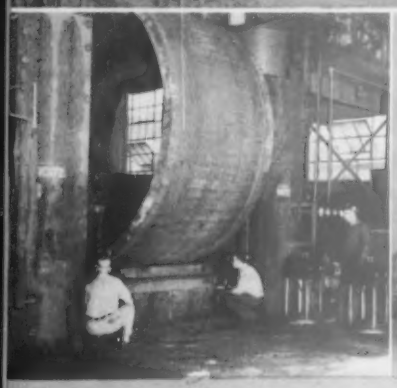


6,900-barrel capacity Hortonspheres built of *T-1 steel* do the work of 20 mild steel vessels and require less area, less shipping weight—were built for Compañia Shell de Venezuela Ltd., at Catia La Mar in 1958.

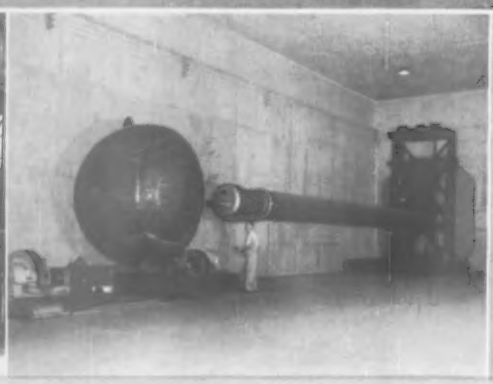
Craftsmanship Counts, at CB&I

▲ *190-foot diameter Hortonsphere* at Dresden Nuclear Power station near Dresden, Illinois. Here, 100-ton derrick lowers final plates into position.

World's largest sphere, a Hortonsphere, was completed in 1954 for AEC for atomic submarine power plant testing. Is 225 feet in diameter, located at West Milton, New York. ▶



CB&I Fabricates . . . 5-inch thick plate for reactor is fabricated at Birmingham, Alabama plant.



CB&I Metallurgy . . . includes the services of 2,000,000-volt x-ray machine. Will inspect vessels up to 10 inches thick.

CB&I Erects . . . anything, anywhere. Here 72-ton top section for reactor-regenerator is lowered into position.

Almost seven decades of specialization in the design, engineering, fabrication and erection of steel plate structures stands behind each CB&I vessel furnished.

Increasingly complex refining operations demand the exacting attention to structural detail that has been made possible by the many CB&I patents and developments in welding, metallurgy, tools, fabrication and erection techniques. Many of them are described on the previous pages.

This *craftsmanship in steel* is the reason why CB&I-built refinery storage and processing structures have become the petroleum industry's first choice for efficiency and long service . . . wherever, in the *world*, refinery products are stored and processed.

Two new CB&I bulletins will be of interest to refinery readers: HORTONCLAD® CB&I's outstanding composite cladding material and *CB&I Special Plate Structures*. Write the nearest CB&I office for your copies.

Chicago Bridge and Iron Company

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Boiler Div., Babcock & Wilcox Co., Barberton, Ohio.

Gravity-Magnetics publication

. . . states that these tools of the explorationist have modern applications in solving specific geologic questions, and at less cost than with other geophysical methods—provided they are used correctly. Bulletin GM59-1 contains informative text, cutaway drawings and photos, and engineering data. Source: **Geophysical Service, Inc., P. O. Box 35084, Airlawn Station, Dept. PI, Dallas 35.**

Flame arrestor for safe operation

. . . of all fired equipment under extreme or normal operating conditions is described in a new eight-page bulletin available now. The literature details an actual five-step test which the unit was subjected to, and gives results of the test. Included are photographs, advantages, and descriptions. Source: **National Tank Co., P. O. Drawer 1710, Tulsa 1.**

Self-policing annunciator systems

. . . for various industrial uses are outlined in Catalog 659, which highlights information on application and operation. The systems are designed to provide continuous and automatic surveillance of pipelines, chemical processing, power generation and distribution, and other fields involving automation or automatic control.

Basic engineering data are offered in the 36-page catalog, along with dimensional charts, line drawings, and typical annunciator diagrams. Source: **Scam Instrument Corp., 1811 West Irving Park Road, Chicago 13.**

Four rubber-tired tractors

. . . are featured in two illustrated brochures now available upon request. One publication stresses cost-to-production ratios of earth-movers, and explains the units' high-capacity scrapers.

Performance figures from several widely scattered construction projects are used to pinpoint actual operating results of these three-wheel tractors.

The brochure also lists various wagons, tailored to work with the units. The second publication explains mechanical features of the Caterpillar No. 14 Motor Grader. It includes colored pictures, size, weight, ratings, and advantages. Source: **Caterpillar Tractor Co., Peoria, Ill.**

20% lighter than cotton duck but just as sturdy and flexible... Quaker Thermoid OS&D Hose

Strong but light. Extremely rugged but flexible. That's Thermoid-Quaker "Quaflex" Oil Suction and Discharge Hose.

It's lighter than reinforced cotton-duck hose, but it won't expand under pressure. It won't collapse under suction. It's exceptionally kink- and crush-resistant.

For more details, call your local Thermoid distributor, or write to *Thermoid Division, H. K. Porter Company, Inc., Tacony and Comly Streets, Philadelphia 24, Pa.*

HERE'S WHY: Separate layers of nylon tire cord surround a helix of high-tensile spring-steel wire in Thermoid-Quaker "Quaflex" Oil Suction and Discharge Hose. That's why it's just as sturdy and flexible as cotton duck, although lighter in weight.

Nylon tire cord for lightness, strength.

THERMOID PORTER DIVISION

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

Growing Together For 40 Years . . .

Prohibition, the Treaty of Versailles and the incredible dash of an American Navy seaplane, the NC-4, were the most historic events of 1919.

Nearly 20,000 sportsmen broiled in a hot Toledo sun to watch a brash young fighter named Jack Dempsey topple the six-foot, six-inch giant, Jess Willard. And 19th Century morality was shocked at the shameless hiking of women's skirts six inches from the floor.

This was the big news of 1919. But there were two important happenings then which didn't make headlines.

One was the organization of the API. And the other was the founding of Skelly Oil Company. In the two score years since their conception, both the API and Skelly Oil Company have boomed.

More than 8,000 delegates are now attending the API Annual Meeting. And now Skelly Oil Company is a $380 million fully integrated oil company with equal stress on production, manufacturing and marketing.

But this is just the beginning. Skelly Oil Company salutes the API on its 40th birthday. And Skelly looks forward to growing with the API in an even more dynamic next 40 years.

OIL'S FIRST CENTURY
BORN IN FREEDOM
WORKING FOR PROGRESS

SKELLY

SKELLY OIL COMPANY

Executive Headquarters: Tulsa, Oklahoma

Division Offices: Aberdeen • Chicago • Dallas • Denver • Des Moines • Kansas City • Lubbock • Omaha • St. Louis • St. Paul • Tulsa • Wichita

▶▶▶ Equipment Men Notes

3 Tuboscope staff promotions

A. B. Roop

. . . are announced by the company's president, J. W. Bozeman. Newly named are A. B. Roop, vice president and general manager; Vernon D. Goins, vice president in charge of operations; and Albin J. Murski, southwest zone manager.

Roop, former regional manager, will take over company-wide management, reporting directly to Bozeman. He has been with Tuboscope Co. for 13 years.

V. D. Goins

A. J. Murski

Goins, now in charge of Tuboscope's domestic operating division, joined the company in 1944. Murski, a company employe for 10 years, will supervise the Corpus Christi and Houston division operations.

NATIONAL SALES MEETING of Byron Jackson Oil Tools, Inc., held recently at Houston, was attended by upper management executives and divisional and regional sales managers from all parts of the United States. Keynote of the 3-day conclave was the company's expanded new product research and development program. R. J. Evans, Jr., vice president and domestic sales manager, directed the meeting. In the front row, from left, are Don Appleford, T. W. Jurling, Harold C. Starr, Vern W. Hillyard, John P. Kirby, and A. R. Boyd. Middle row: W. C. Brooks, O. J. File, A. W. Rose, R. J. Evans, Jr., I. B. Bryan, P. A. Jordan, and G. F. Nicolson. Top row: R. E. Leasure, J. S. Smith, R. G. Taylor, Jr., R. T. Todd, W. F. Roberts, Jr., Si Tamny, and John C. Grant.

Wm. Powell Co. appoints five

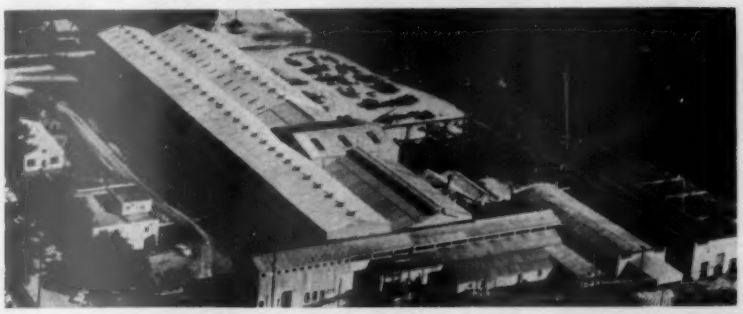
. . . new sales engineers for territories throughout the United States. Engineers, along with their assigned areas, are: Donald O. Petterson, Oklahoma, Kansas, and part of Missouri; William E. Welch, Colorado, Montana, Nevada, Utah, and Wyoming; William J. Mercier, Wisconsin and the upper peninsula of Michigan; William H. Marshall, San Francisco and central and upper California; and H. Alton Pearson, Philadelphia, Chester, and eastern Pennsylvania.

Mid-Continent Supply Co. makes

. . . a movie available to interested groups, according to T. N. Shults, president of the Fort Worth concern. Entitled 720 Hours to Sail, this 25-minute color-sound movie depicts South American drilling operations shot on location, and also the manufacture and shipment of 10 complete drilling rigs to Argentina with only 720 hours to sail.

Coverage of the 1959 International Petroleum Exposition is also featured. The film has also been narrated in Spanish for the benefit of oil-industry people in Spanish-speaking areas.

Send inquiry for use of this film in your organization or club program to: Movie, Dept. of Public Relations, Mid-Continent Supply Co., Box 189, Fort Worth, Tex.



$1,000,000 EXPANSION of the oil-field manufacturing plant at Coffeyville, Kans., has been announced by Parkersburg Rig & Reel Co. Recently completed, the expansion includes two new buildings providing an additional 60,000 sq. ft. of manufacturing space, an automotive-type assembly line for final assembly of oil-field pumping units, drive-through dock facilities permitting multiple loading of trucks, and enlarged outdoor storage facilities. Geared chain driven, and pneumatic pumping units are made and assembled at the Coffeyville plant, along with the Parkersburg Hydrotarder and Hydromatic Brake. Plant operations are under the direction of Plant Manager Jess Kern.

SIE receives a contract

. . . for a gas-pipeline compressor-station remote-control system from Colorado Interstate Gas Co. of Denver. The system will utilize the new solid-state electronics pioneered by Southwestern Industrial Electronics Co. for control of oil, gas, and product pipelines. It's also being applied to the control of well and lease testing and production, LACT, and gathering systems.

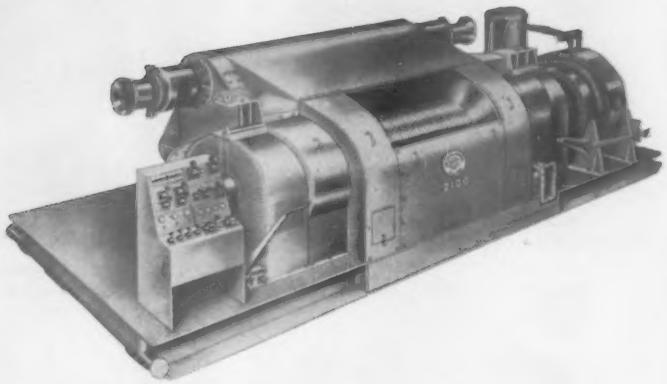
The system will be installed at C.I.G.'s Springfield, Colo., compressor station and will be controlled remotely from Colorado Springs. The system is being installed on a pilot basis to determine control requirements on the complete Utah project.

R. W. (Cliff) Clifford joins

. . . the sales force of W. C. Norris, Mfr., Division of Dover Corp., Tulsa. He has been assigned to the West Texas sales division and will be head-

USE GARDNER-

- Drawworks
- Mud pumps
- Air drilling compressors
- Well servicing pumps
- Rig air compressors
- Air hoists
- Impact wrenches



GD-2100 hp Drawworks
Gardner-Denver engineered for the deepest drilling today and tomorrow. More than 130,000-lb. single line pull. Moved in one load.

Only Gardner-Denver builds all these quality items for your rig

They're engineered for mobility, rugged dependability and simplified maintenance on location . . . designed by men who know your field requirements from firsthand experience . . . built to help you cut costs and drill faster.

Gardner-Denver oil field specialists on call in strategically located cities at all major oil field areas. Parts stocked in supply stores and Gardner-Denver warehouses throughout the oil world.

Gardner-Denver engineers spend time in the field, watching equipment at work . . . learning what you expect it to do. That's why Gardner-Denver equipment serves you better. *There's no substitute for men*—our 100-year philosophy of growth.

GARDNER-DENVER Since 1859 100 1959 YEARS

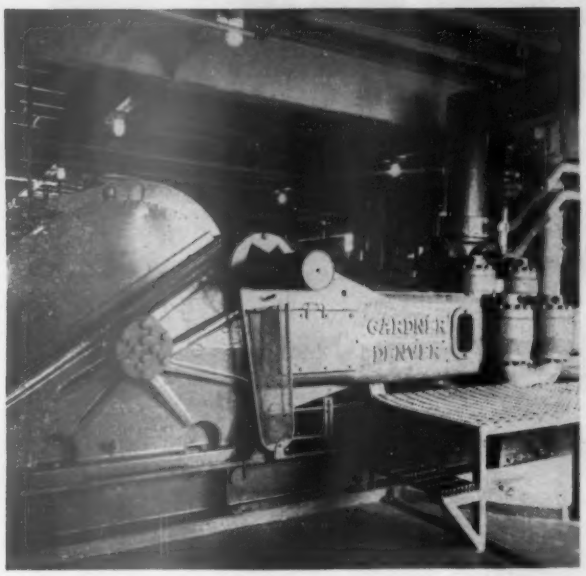
EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario
Gardner-Denver Export Division, 233 Broadway, New York 7, N. Y.
Oil Field Offices: Casper, Cleveland, Columbus, Corpus Christi, Dallas, Denver, Durango, Edmonton, Ellinwood, Evansville, Houston, Huntington, Jackson, Kansas City, Lafayette, Los Angeles, Mexico City, New Orleans, Odessa, Oklahoma City, Pittsburgh, San Francisco, Shreveport, St. Louis, Tulsa, Wichita, Winnipeg

DENVER QUALITY ON YOUR RIG

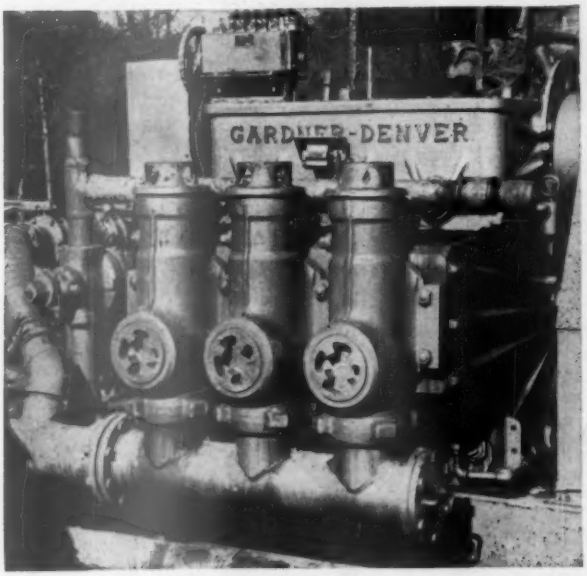


Gardner-Denver Mud Pumps

Famous Gardner-Denver eccentric construction. Divided fluid end cylinders. Models to 1250 hp to meet capacity and pressure needs of every rig.

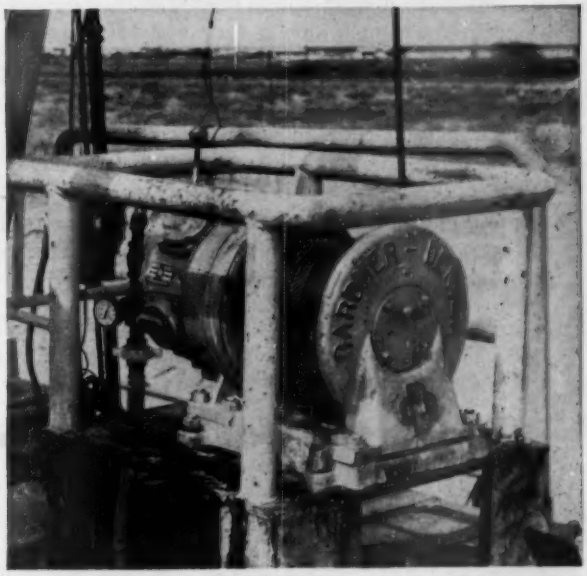
Air Drilling Compressors

Packaged units completely engineered by Gardner-Denver. Cooling system designed for continuous service. Field-proved for air or gas drilling, mud aeration.



Well Servicing Pumps

Triplex and six-cylinder plunger pumps for cementing, acidizing, fracturing or work-over. Provide squeeze pressures to 10,000 psi.

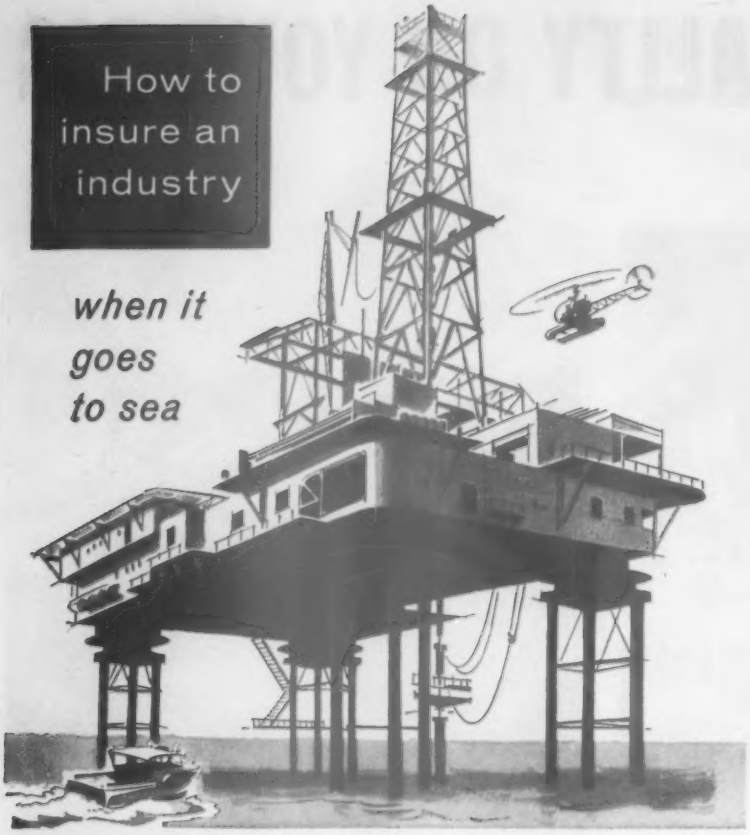


Compressed Air Power

Gardner-Denver air hoists handle snaking and lifting jobs. Impact wrenches and air tools speed maintenance, rigging up and tearing down.

How to insure an industry

when it goes to sea



Exploitation of underwater oil fields is modern industrial drama and a challenge to modern insurance. Offshore drilling platforms, specialized drilling barges, miles of marine pipeline—these involve a complication of hazards and liabilities.

Called upon at the start of this development, Marsh & McLennan found traditional insurance practice inadequate. Our staff pioneered an extraordinary broadening of fire, marine and casualty insurances to establish a new continuity of coverages from exploration and drilling through production and transmission. Insurers agreed to our plan in providing this sound and necessary protection at the lowest obtainable cost. Today we lead in providing this protection.

Marsh & McLennan competence in meeting the offshore challenge is matched by our organization's ability to serve every other field of business and industry. We invite your inquiry.

MARSH & McLENNAN

INCORPORATED

Insurance Brokers

CONSULTING ACTUARIES · AVERAGE ADJUSTERS

Chicago New York San Francisco Minneapolis Detroit Los Angeles Boston Pittsburgh Seattle St. Louis Indianapolis St. Paul Portland Buffalo Duluth Atlanta New Orleans Tulsa Milwaukee Phoenix Cleveland Norfolk Charleston Oakland Montreal Toronto Vancouver Calgary Havana Caracas London

PIPE OF UNVARYING PERFECTION

The most rigorous testing at every stage of manufacture safeguards the unvarying fine quality of Canadian Western Pipe—engineered to meet the most exacting demands of industry.

Write for latest catalogue.

CANADIAN WESTERN PIPE MILLS LIMITED

PORT MOODY, B.C.

Telephone: WEbster 9-1131

B-125

quartered at Midland, Tex. Clifford will specialize in the sale of W. C. Norris butterfly valves.

George Ames is field manager

. . . of pipeline sales for Gar Wood Industries, Inc., announces D. J. Davis, sales director of the Wayne, Mich., concern. Ames will represent Gar Wood-Buckeye ditchers, and will specialize in field application of the firm's pipeline equipment. He will headquarter in Findlay, Ohio.

Ames' experience ranges from a spread superintendent to more than 20 years as a Buckeye representative. Previous to his new appointment, he was Gar Wood - Buckeye southwest district manager. He has represented the firm in Canada and the Far East on special assignments.

Ken W. O'Connor to represent

. . . Michigan Alkali Division of Wyandotte Chemicals Corp. in Texas and New Mexico. He will operate from Houston. Immediately prior to joining Wyandotte, O'Connor was in sales and public-relations work and was a sales representative for Tubular Lining Corp.

Atlas Valve Co. names three

. . . new sales representatives. They include: D. R. Whipple, Schenectady, N. Y., to service eastern New York state; Control Instrumentation Co., Oakland, to handle industrial sales in northern California; and John Stark, Denver, to represent the company in Colorado and southern Wyoming. Atlas manufactures automatic pressure, temperature, and level controls.

J. R. Callaway is appointed

. . . sales representative in Dallas, reports Melvin W. Pauly, vice president in charge of sales for Lunkenheimer Co., Cincinnati manufacturer. Callaway will cover the territories of Lubbock, Midland, Odessa, Hobbs, Dallas, and Fort Worth.

For the past several years, Callaway was production manager for an independent oil producer. In addition to exploitation of primary reservoirs, he has had experience in the design, development, and operation of secondary-oil-recovery projects.

W. M. (Bill) Hunt, Jr. is sent

. . . to Corpus Christi, Tex., and promoted to division office manager of Hughes Tool Co., according to W. H. Siems, general sales manager. Hunt joined Hughes at Abilene, Tex., in 1953 as warehouse and field clerk. He most recently was division inventory coordinator at Abilene.

Wm. Cameron & Co. builds mud research and development lab

. . . at 406 West Illinois, in Midland, Tex. The laboratory is fully equipped to run extensive tests on any material or type of drilling fluid used in the field. Facilities are open to anyone for analyzing products or drilling fluid. Above, from left, are D. D. Warren, Jr., Wm. Cameron & Co.,

H-O-H* GLUCOSATES*

Improved Through Research
Proven By Performance
The Best For Your
Water Treating Problems

WE LEAD WATER H-O-H ESTABLISHED 1911

Write for literature on your letterhead.

*REG. U.S. PAT. OFF.

D. W. HAERING & CO., INC.
ANALYSTS · CONSULTANTS · MANUFACTURERS
P. O. Box 10337
San Antonio 21, Texas

Exterior view of Edgar G. Hill Compressor Station of Michigan Wisconsin Pipe Line Company, a subsidiary of American Natural Gas Company. It is located near Guymon, Oklahoma.

General interior view of the station with the fifteen 2400 hp Cooper-Bessemer Compressors.

Harry A. Crouch, *Superintendent, Edgar G. Hill Compressor Station of Michigan Wisconsin Pipe Line Company, points out an engine feature to* Frank Tuttle, *Division Supervisor (right), and* James Davis, *Engineer (left), and explains...*

How our 15 Cooper-Bessemer Compressors have set a 10 year performance record

"On November 1, 1949, we put our first five Cooper-Bessemer Compressors on the line. Ten more were added during the next year. All 15 of these 2400 hp Cooper-Bessemer units . . . one of the world's biggest compressor horsepower installations under one roof . . . have operated 'round the clock, without interruption, averaging 72,000 to 78,000 total hours. Monthly operating and maintenance costs are averaging only $2.03 per installed horsepower.

"The fact that our Cooper-Bessemer engines have run the equivalent of 2200 times around the globe in an auto at 50 mph—a distance of over 50 million miles—points up the rugged dependability and superior design of these units. Their excellent performance record has fully justified our most confident expectations," says Mr. Crouch.

We will gladly help you assure this kind of performance for *your* compressor operations. Call our nearest office when you start planning new or expanded facilities.

BRANCH OFFICES: Grove City • New York • Washington Gloucester • Pittsburgh • Chicago • Minneapolis • St. Louis Kansas City • Tulsa • New Orleans • Shreveport • Houston Greggton • Dallas • Odessa • Pampa • Casper • Seattle San Francisco • Los Angeles

SUBSIDIARIES: Cooper-Bessemer of Canada, Ltd. . . . Edmonton Calgary • Toronto • Halifax

C-B Southern, Inc. . . . Houston

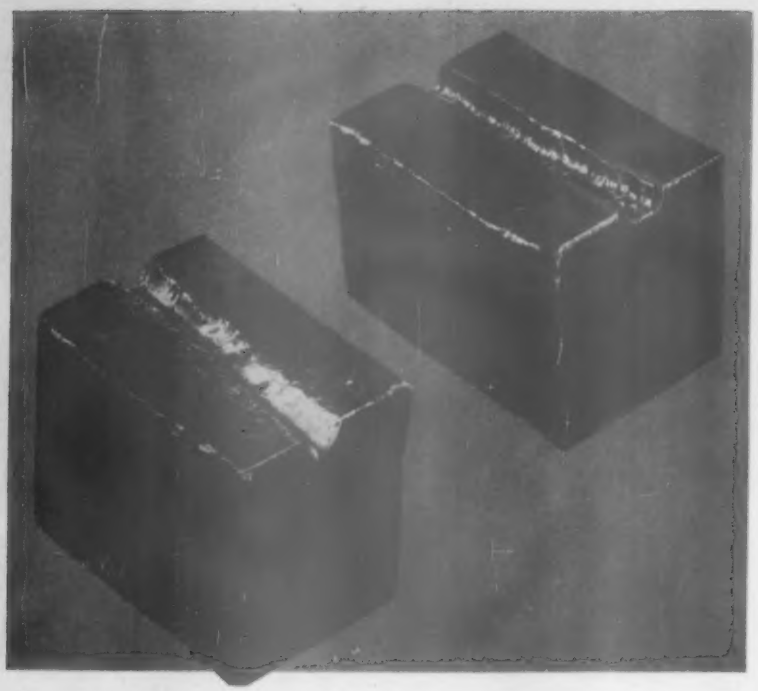
Cooper-Bessemer International Corporation . . . New York • Caracas Mexico City

Cooper-Bessemer, S.A. . . . Chur, Switzerland • The Hague, Netherlands

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE, TURBINE OR MOTOR DRIVEN



Which stainless steel block was grooved in just 12 seconds?

It took 10 minutes to chip a ¼" deep, ⅜" wide groove in this 3¼" long stainless steel block on the left. Arcair did a better job in just 12 seconds . . . or 1/50th of the time. (See block at right.) Groove is 5/16" deep; 7/16" wide. Both blocks were cut from the same stainless steel bar.

You can groove, cut, gouge or bevel *any* metal faster with Arcair . . . get significant cost savings. Yet, the Arcair process costs less than $100.

HOW DOES ARCAIR WORK? The torch uses 80 p.s.i. air, welding machine current and special electrodes to melt and instantly blow away metal. There's no oxidation. New operators learn everything in 15 minutes.

WHAT'S YOUR PROBLEM? Write us. Without obligation, we will recommend correct torch and method to help you cut costs. (Or, call your Arcair welding supply distributor.)

Arcair

THE ARCAIR CO.,
479 S. Mt. Pleasant St., Lancaster, Ohio
Send me more information on Arcair Torches and special electrodes.

(NAME) (TITLE)

(COMPANY)

(ADDRESS) (CITY) (STATE)

MY PROBLEM

CARRYING TEXAS AND LOUISIANA NATURAL GAS TO THE MARKETS WHERE THE MOST PEOPLE ARE

New Hudson River crossing, part of Transco's $100,000,000 construction program for 1959.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

manager of Snyder; William Beard, division engineer; and W. E. Holman, special project engineer, both of Midland.

Pelich, Krepps are appointed

. . . to the sales and service staff of Denison Engineering Division, American Brake Shoe Co., reports Denison Neale, sales director.

William J. Pelich has been named sales manager, in which position he'll be responsible for marketing all company equipment. Robert Krepps, former sales manager, now undertakes a new company post—manager of marine and military systems—which includes all government services.

Burgess-Manning Co. appoints

. . . three Canadian sales representatives to handle industrial silencers and pulsation snubbers. Companies named are Bass Industrial Equipment of Canada, Ltd., Toronto; Assoc. Instrumentation & Controls, Ltd., Montreal; and Belen-Lynn McGuffy Co., Ltd., Calgary.

Eastman Oil Well Survey is sold

. . . to Philip D. Arterburn (right), the company's financial adviser for the past 16 years. H. John Eastman (left), company founder and former president, will continue on as board chairman and director.

The firm was launched in the 1930's when Eastman developed the idea of controlled directional drilling and hit a well offshore in southern California from dry land. Later he put out the Conroe, Tex., oil fire by drilling a directional relief well which hit an 8-in. target at 5,135 ft.

Today the company controls Eastman International Co. of Hanover, Germany, Eastman of Venezuela, and Eastman of Canada. Sales-service representatives are maintained around the world.

Marketing agreement completed

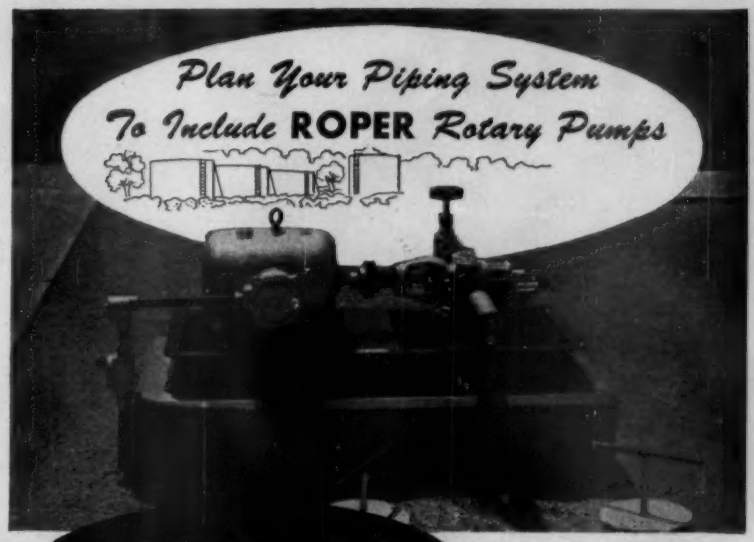
. . . whereby the Societe Nationale de Materiel pour la Recherche et l'Exploitation du Petrole (S.N. MAREP) is licensed to make use, rent, and sell well-completion products of Shaffer Tool Works throughout France, its territories, and major areas of Europe.

Products to be handled include Shaffer casing heads, tubing heads, wellheads, flow beans, christmas trees, and related equipment. The agreement also permits S.N. MAREP to make, use, rent, and sell the Shaffer products in all countries belonging to the European common market, including Morocco and Tunisia.

J. M. Brannaman is appointed

. . . branch manager in which post he will initiate the new Cooper-Bessemer field office in Pittsburgh. George Edick, sales manager of C-B's Domestic Division, made the announcement.

The Pittsburgh office, under direct supervision of F. M. Devin, vice



Throughout the oil world there are thousands of Roper Series F Pumps on the job. Big reason is *dependability*. Other reasons include: smooth, non-pulsating flow . . . equal size gears running in axial hydraulic balance . . . positive displacement requiring no priming . . . and importantly, four-port design. This latter feature of the Roper Series F Pump allows greater flexibility of installation . . . cuts installation time and costs. Four-port design, you see, permits 8 optional piping arrangements — 4 for CW and 4 for CCW operation. There are other Ropers in the line . . . in the pumping range and pressure range you require. Ask your distributor for all the facts . . . he'll show you how Roper can give you better service and higher efficiency in field storage, gathering line, and tank truck installations.

Roper Hydraulics, Inc.

Dept. 501 P. O. Box 269
Commerce, Georgia

ROPER
ROTARY PUMPS

Sales and Service in All Oil Producing Areas

Draw works showing Tiger Brand Wire Rope after 14 months of service. Only the best wire rope was good enough for this job.

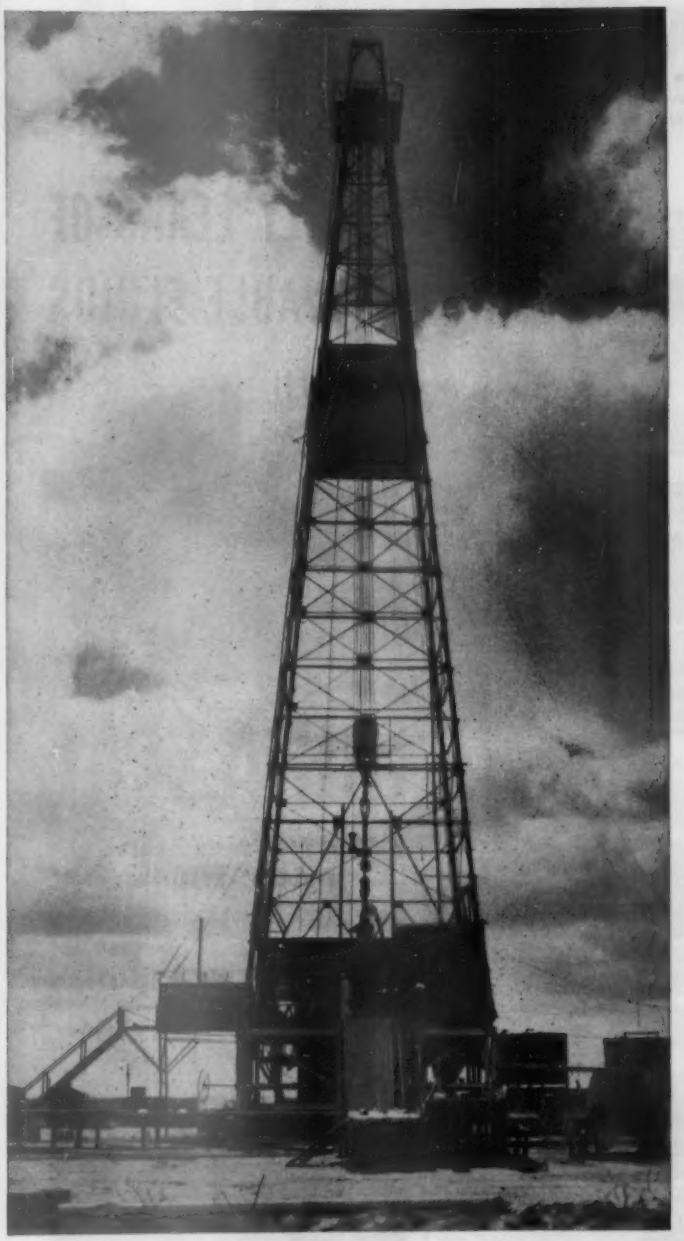
50 miles offshore

Dixilyn Drilling uses USS Tiger Brand—

50 miles offshore the "Julie Ann" is drilling in the Vermillion area southwest of New Orleans. The million-pound derrick is rigged with Tiger Brand Wire Rope to assure long, trouble-free service.

and west of the Pecos—

America's No. 1 Wire Rope



West of the Pecos River, Dixilyn Rig No. 3 drilling near Odessa, Texas, Upton County. The 7,500 feet of Tiger Brand 1¼" Drilling line being used on this well had already drilled three wells without trouble. The tool pusher, Mr. J. B. Booth, is very satisfied with the service he gets from USS Tiger Brand drilling lines.

The "Julie Ann" is the newest offshore drilling platform of Dixilyn Drilling Corporation, New Orleans. It can drill in water over 100 feet deep—to drilling depths in excess of 25,000 feet. It is the first LeTourneau drilling platform designed to include 175-foot legs. The million-pound, two-well derrick is mounted to permit the drilling of six wells from the same platform location.

Dixilyn operates a total of seven rigs—all are equipped with USS Tiger Brand Wire Rope. Mr. Russel V. Tidwell, General Manager, says, "We use Tiger Brand because it gives us better service than any other rope we ever tried. We watch our ton-mile records and Tiger Brand has definitely reduced our wire rope costs."

The "Julie Ann" is rigged with 5,000 feet of 1½-inch Tiger Brand Monitor Excellay Preformed Rotary Drilling Line. The rope had been in service 14 months when the photographs were taken and it was still in excellent condition.

For complete information about Tiger Brand Wire Rope for oilfield use, write for our catalog, American Steel & Wire, Dept. 9355, 614 Superior Ave., N.W., Cleveland 13, Ohio.

USS and Tiger Brand are registered trademarks

Why Tiger Brand is your best buy

1. It is made by a company that maintains the most complete research and manufacturing facilities in the steel industry.
2. It is designed by one of the country's most capable staffs of wire rope engineers. It is serviced by thoroughly experienced field representatives always ready with their assistance.
3. Every type of Tiger Brand Wire Rope is designed for specific applications. *You* get the *right* rope for the job.
4. It is made by *one* company, U.S. Steel, and every step of production from ore to finished product is carefully controlled and supervised to guarantee *one* high standard of quality.
5. Tiger Brand Wire Rope is manufactured by the foremost single wire rope producer in the country.

American Steel & Wire Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, Distributors Abroad

HENRY H. PARIS DISTRIBUTOR, Inc.

OIL WELL, REFINERY AND INDUSTRIAL SUPPLIES

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Agent and Distributor for the Following Nationally Known Manufacturers

ALTEN FOUNDRY & MACHINE WORKS
Lancaster Ohio
Surface Equipment.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

DRESSER MANUFACTURING DIV.
Bradford, Pa.
Seamless Welding Fittings, Couplings and Sleeves.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

THE FAIRBANKS COMPANY
Binghamton, N. Y.
Bronze and Iron Valves.

STEEL FORGINGS, INC.
Shreveport, La.
Weld Saddles.

THE GORMAN RUPP COMPANY
Mansfield, Ohio
Centrifugal Pumps.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

HARRISBURG STEEL COMPANY
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Casing Couplings.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

LOS ANGELES BOILER WORKS, INC.
Los Angeles, Calif.
Welding Caps—Dished & Flanged Heads.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

STOP!

COSTLY LEAKS OF VALUABLE FLUIDS

WITH

DURA SEAL

THE ENGINEERED MECHANICAL SEAL

Savings in product alone will repay the cost of Dura Seal installation

For further information, write for free Bulletin No. 4800G

The PERFECT SEAL

DURAMETALLIC CORPORATION
KALAMAZOO, MICHIGAN

president and district manager, will handle sales and engineering contacts in areas of eastern Ohio and western Pennsylvania. Brannaman was with American Potash & Chemical Corp. before joining Cooper-Bessemer.

John C. Madden is appointed

J. C. Madden

. . . sales manager, oil-country tubular products, for National Supply Co., succeeding W. R. Ryburn. Madden joined the company in 1952 as sales representative in the New York district office of the Tubular Division. He was made assistant district manager there in 1955, and was transferred to the Export Division as tubular manager the following year.

J. D. Gladden assumes post

. . . as sales manager of the new southwest region of International Harvester Co.'s Construction Equipment Division, reports R. G. Greer, divisional sales manager. Gladden, formerly assistant manager of the plains region, now will handle Missouri, Kansas, Oklahoma, Texas, New Mexico, and three counties in Arizona.

Herrin is named sales manager

. . . of two-way radio products for the 10-state western area of Motorola Communications & Electronics, Inc. A Motorola employe the past 6 years, Charles Herrin has been an account executive in the western area since April 1958. He was appointed a zone manager in 1956.

In his new capacity, Herrin will coordinate sales of two-way mobile and portable-radio equipment in five sales regions within the area. Reporting to Donald F. Brickley, area vice president and manager, Herrin will locate in Burlingame, Calif.

Two sales promotions announced

. . . by Verne W. Aubel, sales director of Solvay Process Division, Allied Chemical Corp. Jerome L. Hochenedel has been appointed assistant manager of Solvay's Houston sales branch. E. Kenneth Leins has moved from the division's technical-service department at Syracuse to its New Orleans sales branch to take over the Baton Rouge sales territory.

Hochenedel joined Solvay in 1951 and, since that time, has been a salesman reporting to the New Orleans branch office and covering the Baton

LOW COST PROTECTION

stops HIGH COST engine damage

Overheated jacket cooling water or lubrication oil pressure failure can develop anytime . . . and it can develop in the best of engines! When this happens, serious engine damage can occur. To prevent such costly damage, engines, particularly non-attended engines, need the protection given by Penn Safety Controls. Learn more about this low cost protection for new and old engines.

PENN CONTROLS, INC. Goshen, Indiana

EXPORT DIVISION: 27 E. 38th ST., NEW YORK, N.Y.

AUTOMATIC CONTROLS FOR HEATING, REFRIGERATION, AIR CONDITIONING, APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

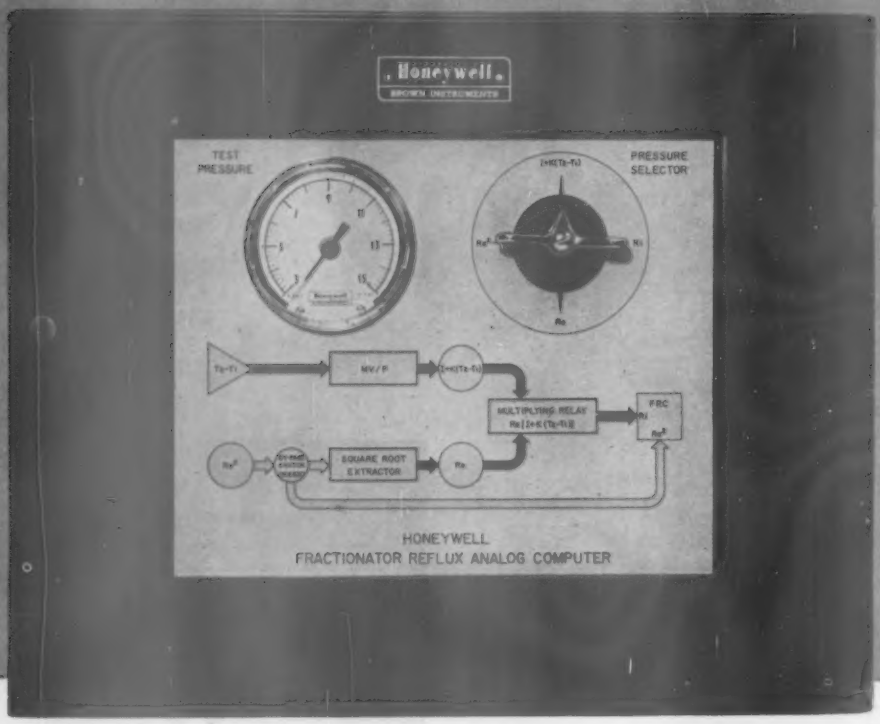
$Ri = Re\,(1 + K\,(T_2 - T_1))$

Ri—Internal reflux

Re—External reflux

$K = \frac{\text{Specific heat of Re}}{\text{Heat of Vaporization of Liquid on top tray}}$

$T_2 - T_1$—Temperature difference between external reflux steam and overhead vapor



Honeywell "Frac" unit is easy to use and maintain

- **Standard Honeywell components**
- **Standard Honeywell strip chart case**
- **Simple, easily accessible connections**
- **Chassis pulls out for front-of-case servicing**

COMPONENTS

MV/P Transmitter (millivolt-to-pressure)

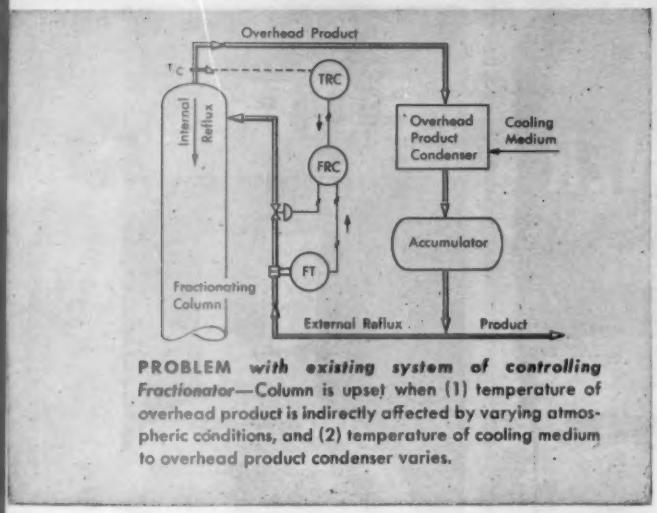
- Fully transistorized
- Continuously sensitive to temperature change
- Constant voltage supply
- Simple span and zero adjustments

Pressure selector and test pressure gage

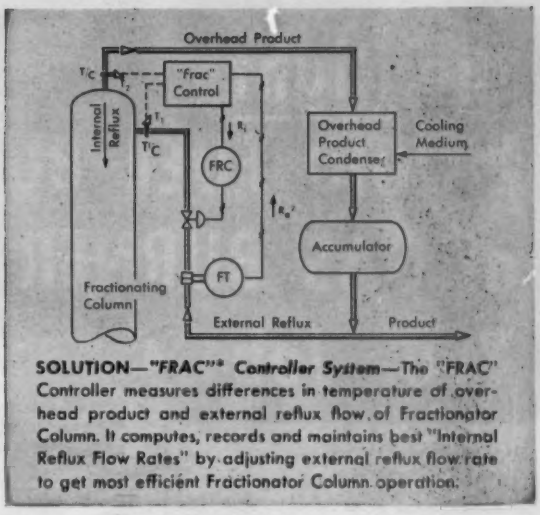
- Provide check of all pneumatic pressures within the computer for simplified trouble shooting.

By-pass switch

- Permits switching from internal to external reflux flow measurement and control.



PROBLEM ***with existing system of controlling Fractionator***—Column is upset when (1) temperature of overhead product is indirectly affected by varying atmospheric conditions, and (2) temperature of cooling medium to overhead product condenser varies.



SOLUTION—"FRAC"* *Controller System*—The "FRAC" Controller measures differences in temperature of overhead product and external reflux flow of Fractionator Column. It computes, records and maintains best "Internal Reflux Flow Rates" by adjusting external reflux flow rate to get most efficient Fractionator Column operation.

New Honeywell "FRAC"* Controller stabilizes fractionating column operation

- **Easily Installed and Maintained by Present Instrument Technicians**
- **Savings Realized Justifies Installation**
- **Tamper-proof Design**

This new Honeywell control system immediately adjusts column operation to the effects of ambient temperature on overhead product condenser and external reflux. It continuously computes *internal* reflux flow, to maintain the most efficient, economical fractionating tower operation.

The new method, originally developed and licensed by Phillips Petroleum Company, utilizes a simple Honeywell analog computer employing standard industrial electric and pneumatic instrument components.

In correcting instantly for temperature deviation, the new control system offers many economies.

Less reboiler heat is required, because large surges of internal reflux that would lower temperature are eliminated. Reduction in off-specification product minimizes re-runs and the need for intermediate storage. Quicker on-stream time allows fuller use of equipment. Closer control permits fractionator to operate closer to the flooding point. Elimination of condenser temperature controls reduces both equipment costs and maintenance.

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

*Fractionator Reflux Analog Computer. Trademark, Minneapolis-Honeywell Reg. Co.

Honeywell

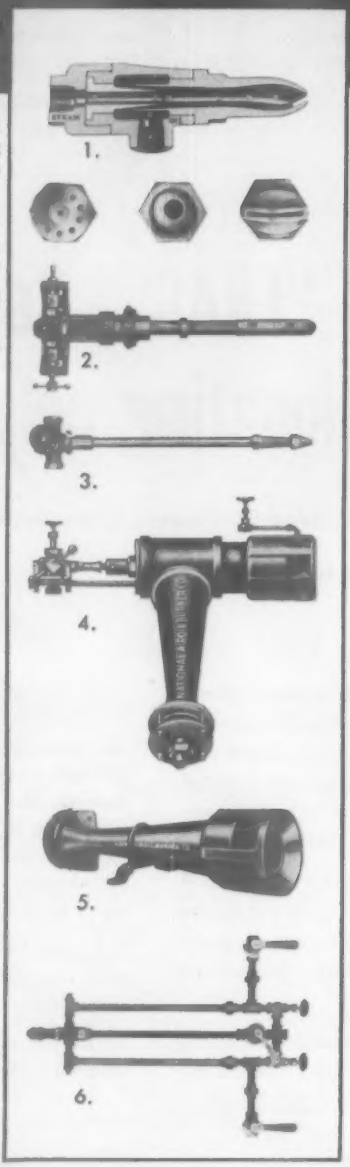
H HONEYWELL *First in Control*

the Right LIQUID FUEL BURNER or GAS BURNER for Your Job

Whether you burn oil, gas or a combination of these fuels, there's a NATIONAL AIROIL BURNER for *your* needs.

Our more than 47 years' experience in the design, development and manufacture of all types of industrial gas-oil burners is at your service.

Ask us about your requirements . . . we'll gladly cooperate.



1. TYPE S-A
Uses steam or compressed air for atomization. Thoroughly atomizes and completely burns the lowest and cheapest grades of fuel oil and tars. Requires only low oil pressure and temperature.

2. TYPE S-A-L
Large capacity burner of steam atomizing type. Adaptable to large boilers or dual fuel systems. Is frequently used for firing boilers above existing coal grates—also for alternate firing on pulverized coal burners.

3. TYPE S-A-R
(Where steam, or gas is available for atomizing) safely and efficiently burns residuums obtained from process, including high temperature pitches and tars.

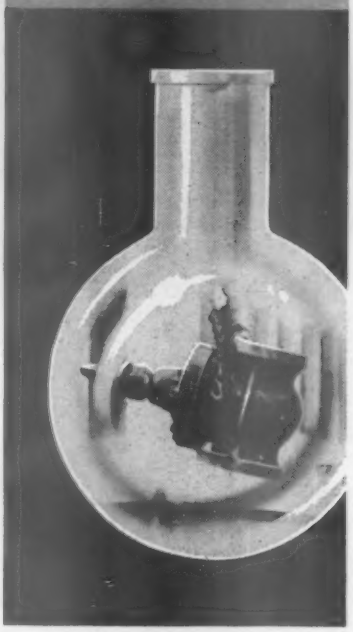
4. COMBINATION GAS AND OIL BURNER
An Airocool Inspirating Gas Burner combined with a Type S-A-R oil burner for safety and efficiency when burning process oils and gases as well as commercial fuels.

5. AIROCOOL GAS BURNER
Venturi type with patented long-life Airocool Nozzle assures trouble-free operation and provides low turndown without burnback.

6. TYPE S-A-D
(Refuse Oil Burner) burns acids or caustic oils, sludges, asphalts, tank bottoms, polymer oils, heavy petrolatum, organic oil residuums, waste cutting oils, sulphite pulp liquors all in combination with fuel oil.

National Airoil
BURNER COMPANY, INC.
Main Office & Factory: 1236 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.
SOUTHWESTERN DIVISION: 2512 SOUTH BOULEVARD, HOUSTON 6, TEXAS

Oakite
ECP...



Best way to save with salvage

RESULTS show that the best way to salvage equipment is the Oakite ECP way . . . which reclaims parts in volume via chemical cleaning. At one refinery, salvage became a major cost control factor with installation of permanent Oakite tanks. They cut cleaning time *from 22 hours to 1½ hours* a batch, slashed material cost *from $1.90 a gallon to less than 23 cents.*

An Oakite ENGINEERED CLEANING PROGRAM is developed specifically for your refinery, gives detailed recommendations for everything from coolers to crackers. The Oakite engineer sticks with the job till it's done to satisfaction. Along with his experience go products and methods developed by one of the finest chemical cleaning research facilities in existence.

Send for more data. Oakite Products, Inc., 39 Rector St., New York 6, N. Y.

OAKITE ECP your economy key
In our 50th year

Rouge territory. A Solvay employe for the past 10 years, Leins has had both plant and field experience as a member of the company's technical-service staff.

E. C. Bolton is appointed

. . . western regional sales manager of Cutler-Hammer, Inc. Bolton, who will headquarter in Chicago, has been on the Cutler-Hammer engineering and sales staffs the past 37 years. He most recently managed the company's district sales office in Cincinnati.

Replacing Bolton in Cincinnati is J. H. Sauer, formerly manager of Cutler-Hammer's Indianapolis district. R. A. Pancoast, of the Philadelphia sales staff, has been elevated to Indianapolis manager.

J&L appoints sales managers

. . . for the Central Rocky Mountain and eastern Oklahoma districts, reports W. L. Wolfe, vice president in charge of sales.

Henry Franks takes over as manager of Jones & Laughlin Supply Division's Central Rocky Mountain district at Casper, Wyo., and C. W. Moore assumes district managership over eastern Oklahoma.

Franks' appointment fills the vacancy created by the recent death of Marvin Park. Franks joined J&L as special representative in 1950. He was

Henry Franks

C. W. Moore

promoted to manager of the subsurface-equipment section in 1957 and held this job until the present.

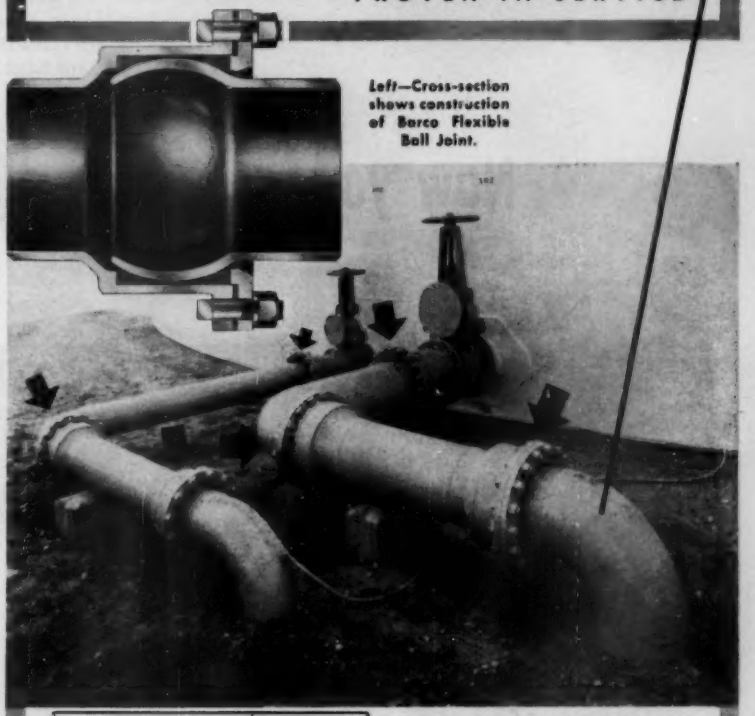
Moore's appointment fills the vacancy made by the death of A. A. Hopper, J&L's manager in Bartlesville for several years. Moore is a veteran of 36 years' service with the company. He has held several store manager and sales assignments with J&L, the latest being that of supervisor of store construction and maintenance.

Nalco Chemical Co. appoints

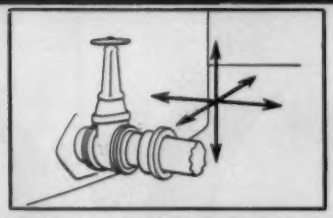
. . . James E. Starry district manager for its Texas district with headquarters at Houston, reports Herbert S. Johnson, manager of Nalco's Industrial Division. Starry succeeds William H. Rodewald who recently was named vice president and general manager

Unlimited Flexibility!

—PROVEN IN SERVICE



Left—Cross-section shows construction of Barco Flexible Ball Joint.



Allows 6-Way Movement!

Freedom of movement in any direction is readily possible with these ball joint connections of 12" pipe (right) and 8" pipe (left) to 80,203 bbl. tank shown in above photo. (Photo: SHELL OIL COMPANY, Dominguez Refinery, Wilmington, Calif.)

Barco Ball Joints—*Fire Safe!*

provide complete protection against FIRE, PIPE EXPANSION, TANK SETTLING

Major oil companies throughout the country now approve the use of Barco's new large size Flexible Ball Joints on tank connections for the following reasons:

1. Fire-safe. The joints have passed rigid fire and water spray tests.
2. Superior for handling pipe expansion—no combustible packing, no thin wall sections, no "end thrust" from pressure, no heavy pipe anchoring required.
3. Complete protection—relieve strain and twisting forces on valve flanges or tank wall.
4. Compact! Ideal for use inside narrow space between fire wall and tank. Easy to design piping for any amount of flexibility desired.
5. Also useful for insulating piping against electrolysis.
6. Long service life without maintenance. No lubrication. Sizes to 16"; flanged or welding ends.

For engineering recommendations, see your nearest Barco representative or write. ASK FOR CATALOG 215B and BULLETIN 31-A.

PRODUCTS BACKED BY EXPERIENCE BARCO FOUNDED 1903

BARCO MANUFACTURING CO.

539M Hough Street • Barrington, Illinois

The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Revolving Joints

In Canada: The Holden Co., Ltd., Montreal

Now you can cut pressure vessel weight

The use of 299 tons of USS "T-1" Steel in these two Hortonspheres saved 216 tons of carbon steel and 42% in shipping costs. Designed and erected by Chicago Bridge & Iron Company for storing propane gas in Venezuela. These tanks were designed to the old code limits, but under the new code limits they could have been made up to 9.5% lighter.

Revisions in case 1204-4 of the ASME Code for boilers and pressure vessels increase maximum allowable stress value to 28,750 psi for "T-1" Steel. This permits further reductions in weight up to 9.5%.

even more with USS "T-1" Steel

The new figure of 28,750 psi represents an increase of 9.5% over the previous maximum allowable stress value of 26,250 psi which applied to USS "T-1" Constructional Alloy Steel used in pressure vessels. This means that USS "T-1" Steel can be used to reduce weight even more than it did before in stationary vessels or truck tanks.

The steel frequently used in welded, unfired pressure vessels is ASTM A-285-Grade C. This steel can be used with a maximum allowable design stress of 13,750 psi. From this, you can see that the allowable stress for "T-1" Steel is 2.1 times greater. To put it another way, plates of "T-1" Steel in a pressure vessel need be only half the thickness of A-285-C plates to withstand the same stress.

15% overall savings possible with "T-1" Steel

USS "T-1" Steel permits a 50% reduction in the amount of steel used in the vessel; this results in large savings in the cost of structural supports and foundations, welding, freight, handling costs and the elimination of stress relieving costs.

In a recent design, pressure vessels designed of both A-285-C steel and "T-1" revealed the following cost analysis:

	Use of "T-1"
Weight of steel	saved 50%
Cost of steel	only 20% more
Fabrication cost	saved 40%
Freight	saved 50%
Amount welding wire	saved 60%
Total savings	**15% cheaper overall**

These savings, plus USS "T-1" Steel's unique combination of toughness at low temperatures, high strength at elevated temperatures, and weldability, offer the pressure vessel designer the *only* material of this high strength level possessing *all* the qualities so important in the pressure vessel field.

For more information, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and "T-1" are registered trademarks

USS

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
National Tube Division – Pittsburgh
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
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fly DELTA'S DC-7
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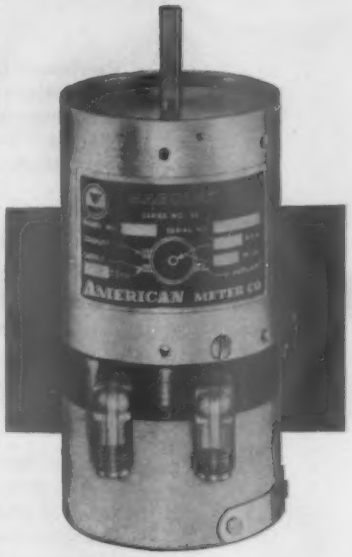

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GASCLOK
POWER DRIVE

Completely self-contained gas or air-powered instrument driving and timing unit for long, trouble-free operation in remote locations. The GASCLOK delivers more than 20 times the torque of conventional spring-wound mechanisms. Continuous timing accuracy is unaffected by a ± 20% variation in supply pressure.

Inherently explosion proof and self-starting, the GASCLOK is ideal as original or replacement equipment for strip chart and conventional circular chart instruments. The timing mechanism is internally sealed to prevent corrosion, and all power unit parts exposed to gas are aluminum or stainless steel. Large area internal ports prevent clogging. Normal air or gas consumption 5 cfh . . . operating pressure 5 psi . . . rotation 2 rpm.

AMERICAN METER CO

AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1836)

Executive Offices: Philadelphia 16, Pa.
Sales offices in principal cities.

of the company's Venezuelan subsidiary.

Starry, who has been with Nalco since 1948, most recently was product manager of the coagulation-chemical department of the company's Industrial Division in Chicago. Earlier he was a field representative and area manager in the Indiana district.

John T. Burke has been promoted from area manager in the Pittsburgh district to Starry's former post as product manager of the coagulation-chemical department. He also has been with Nalco since 1948, serving as field and district representative before being named area manager in Pittsburgh.

Robert M. Cornforth to head

R. M. Cornforth

. . . sales activities of Genesys Corp. control computer systems for process and pipeline applications. Recently appointed sales manager, Cornforth will work under the direction of John F. Davis, vice president of the electronic firm.

Cornforth formerly was manager of refinery sales of Kaiser Engineers Division, Henry J. Kaiser Co. He also had sales-manager experience with Houdry Process Corp.

Power Pumps, Inc. announces

. . . the opening of a branch store in Bakersfield, Calif. Its purpose, according to Ralph Abbott, president of the Long Beach, Calif., distributor, is to bring Gaso pump and parts service closer to operations of customers in the San Joaquin Valley area.

GM distributor opens new plant

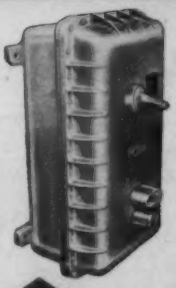
. . . in Denver for the sale and service of GM Diesel's all-purpose power line. Dobbs GM Diesel, Inc., with O. L. (Larry) Dobbs as president, assumed the distributorship last December, but official announcement was withheld until the new facilities were completed.

Dobbs formerly operated the GM Diesel dealership at Fort Morgan, Colo. Branches are now operated at Fort Morgan and at Casper, Wyo. Associated with the company are Dick Jeffries, sales manager; Glenn Donaldson, parts manager; and Earl Goble, service manager.

Charles R. Hook resigns

. . . as chairman of the board of Armco Steel Corp. after 57 years of service with the firm. Directors responded by

for LIGHTWEIGHT INSTALLATIONS HEAVY DUTY SAFETY



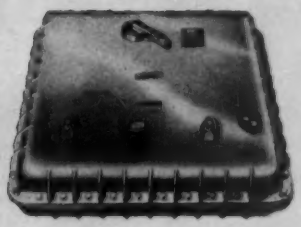
KILLARK

EXPLOSION-PROOF MOTOR STARTER ENCLOSURES

Popular lightweight cast Alumalloy — strong and carefully machined for positive operation; dependable, low-maintenance service. Available with starter of your choice.

XMS Series Starter: incorporates standard magnetic across-the-line starter equipment sizes 0 thru 5.

XMCS Series Combination Starter: with starters 0 thru 5 with protective circuit breaker or disconnect.



WRITE for illustrated bulletin.

Killark

ELECTRIC MANUFACTURING COMPANY

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- HYDRAULIC FLUIDS
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OVER A QUARTER OF A CENTURY OF EXPERIENCE... is yours for the asking, regardless of size or nature of your filtration problem.

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- ☐ TANK TRUCK MANUAL
- ☐ COMPRESSED AIR FOLDER
- ☐ HYDRAULIC FLUID MANUAL
- ☐ GENERAL CATALOG

Name _____

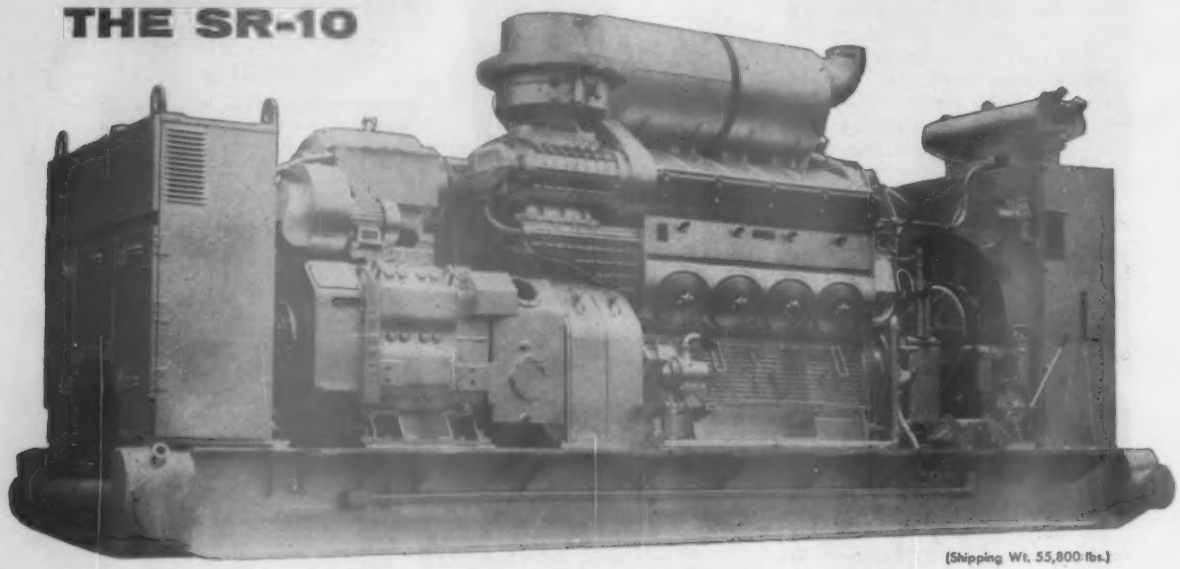
Company _____

Address _____

ELECTRO-MOTIVE

—for deep drilling

THE SR-10



(Shipping Wt. 55,800 lbs.)

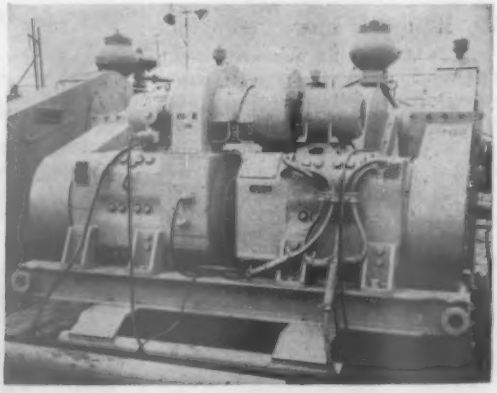
The standard of Diesel-electric power

Electro-Motive power has been picked for more deep well applications than any other Diesel-electric system. Its record of dependability, low maintenance and economy, recorded under every conceivable operating condition, have made it the outstanding choice for both land and offshore applications. Most important, it is the *only* deep well Diesel-electric system manufactured and backed by one company.

The SR-10 is the newest Electro-Motive deep well power unit. It is the first standardized, completely self-sufficient power system. An integral AC generator eliminates need of outside AC power for blowers, excitation and control equipment. The 1000 hp 8-cylinder Diesel engine drives two generators that produce 640-KW each. Models are available for Dual-fuel operation.

Sensitive, accurate control

Controls for the SR-10 combine the "feel of steam" with the instantaneous response and accuracy of electric drive. Compact, centralized panel gives the driller supervision of all Diesel-electric equipment including safety shutdown.



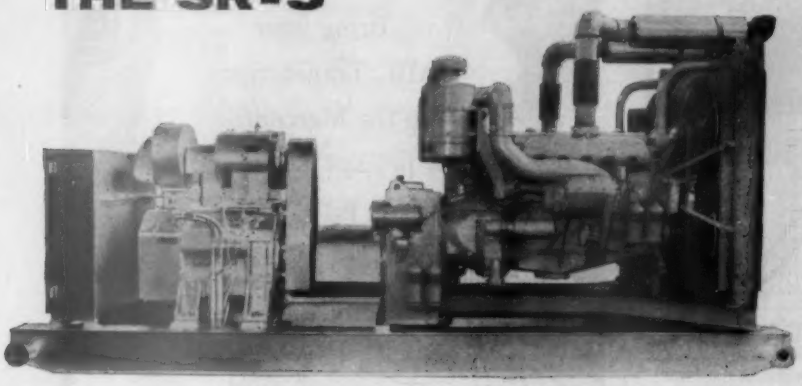
Flexible, positive power

Drive motors for the SR-10 deliver up to 800 hp. The D-49 motor provides smooth and rapid acceleration of loads with positive control of speed and torque. Both drive motors and generators are identical except for field windings, a factor that reduces service costs.

POWER

—*for medium depth drilling*

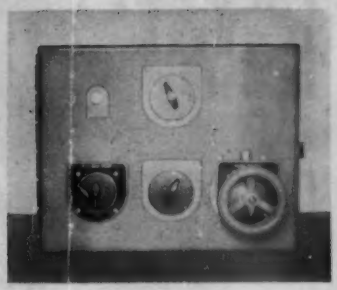
THE SR-5



Simple, economical, adaptable

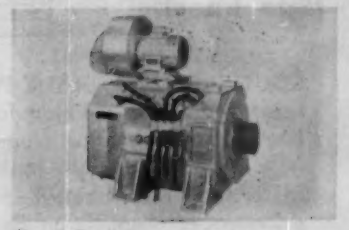
The SR-5 was specifically designed to meet the needs of medium depth drilling. It combines extreme simplicity of design in a compact, portable assembly that saves hours and dollars on rig-up, tear-down and moving operations. Though new in concept, the SR-5 contains the tested dependability, low operating and maintenance features of Electro-Motive SR-10 equipment.

The Basic SR-5 set is a two generator, two drive-motor arrangement. By combining units, drilling power can be tailored to the job for the most economical power arrangement. Skid unit is pictured with a Detroit Diesel engine, though any engine (gas or Diesel) of comparable power may be used.



Driller's Control

Simple control panel of SR-5 requires no special training or electrical knowledge. Sensitivity of controls permit driller to maintain a high drilling rate with complete accuracy and balance.



D-49 drive motor

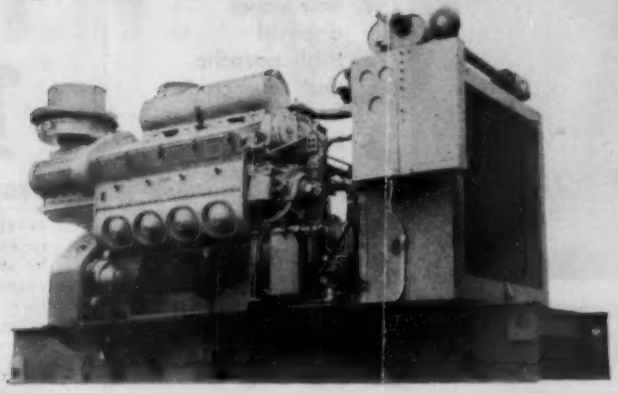
The SR-5 utilizes standard and tested motor components. Electro-Motive drive motors are perhaps the most widely used electric motors for drilling applications. Their dependability and torque characteristics offer speed and power flexibility to meet all drive requirements.

—*for dependable pumping*

THE SK-10

For large capacity pumping operations, the Electro-Motive SK-10 provides a compact and portable skid unit, complete with cooling system and engine controls. The seasoned 567 engine is well suited to the torque and horsepower requirements of pumping applications. The engine is balanced to eliminate any vibration between the set and accessories.

The dependability, low maintenance and economical fuel characteristics of the SK-10's engine have been inherited from General Motors' more than twenty-seven years of Diesel engine manufacture. SK-10 units are available for Dual-fuel operation and heat exchanger cooling.



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electing him honorary chairman. He will continue as a director.

Hook began his career with Armco at the age of 22. He started in 1902 as night superintendent of Armco's first plant in Middletown, Ohio, and rose rapidly through the ranks. He became a director in 1918, president in 1930, and chairman of the board in 1948.

E. L. (Ned) Kent, Jr. is named

. . . western division manager for Coast Paint & Lacquer Co., Inc., manufacturers of Copon corrosion - control coatings, lacquers, paints, and synthetics. He will supervise all sales operations in the western part of the United States.

Craig M. Rowley elected prexy

. . . of Parkersburg Rig & Reel Co., division of Parkersburg-Aetna Corp., according to B. P. McDonough, president of Parkersburg-Aetna. The new president will continue to headquarter in Houston where the operating portion of Parkersburg executive offices are located.

Rowley previously served as executive vice president and general manager of Parkersburg Rig & Reel. Before joining the company in 1957, he was chief petroleum engineer of Sinclair Oil & Refining Co. in Venezuela.

Oil Well Supply Division names

. . . A. L. Crenshaw field representative at Laurel, Miss., and appoints F. L. Akers district representative at Borger, Tex., reports Melvin F. Jones, Gulf Coast area manager of the U. S. Steel Corp. division.

Crenshaw was employed by Oilwell 3 years ago at Harvey, La., and was appointed field representative there the next year. He was transferred to Morgan City, La., and to Houma, La., before his present assignment.

Akers began with the division in 1923 at Borger. He held several managerial positions in Texas from that time until leaving the company in 1945. Akers returned to the division in 1957 and was appointed store manager at Borger.

Kenneth R. Lord is promoted

. . . to division sales manager for the Edmonton division of Hughes Tool Service, Ltd., according to W. H. Siems, general sales manager of Hughes Tool Co. Lord replaces D. W.

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BALL BEARING MOTORS

Here's Why . . .

They are specifically designed to overcome the unusual conditions of Oil Field requirements, and there is a type and H.P. built to fit your exact needs. Unexcelled since they are . . .

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SEMI-ENCLOSED — normal or medium slip, 3 phase, 60 cycle. Has prelubricated ball bearings in semi-enclosed protected housing, 40 degree C rise. Built for continuous duty. **High Torque, low starting** current. Extra insulating coating throughout.

TOTALLY ENCLOSED — Fan cooled, normal or medium slip, 3 phase, 60 cycle. Has prelubricated ball bearings, totally enclosed FAN cooled 55 degrees C rise, for continuous duty. High Torque — low starting current. Extra insulating coating throughout.

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"BEVEL-LAND" GRINDER

automatically cleans and lands pipe bevels

The new H & M "BEVEL-LAND" GRINDER employs an electric grinder to automatically clean and smooth pipe cuts and put the land on bevels. The machine may be placed on the pipe and in operation in less than one minute. A simple adjustment in angle of the grinding wheel is all that is required to change the machine from the cleaning to the land position. The H & M "BEVEL-LAND" GRINDER assures more postive alignment of pipe and better quality welds. The machine is available in two models: one for 6" to 14" and one for 14" to 36" pipe.

WRITE FOR YOUR COPY OF A CATALOG SHEET WHICH DESCRIBES ALL THE FEATURES OF THE NEW H & M "BEVEL-LAND" GRINDER.

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THAT CAN MEAN THOUSANDS OF DOLLARS IN UNTAPPED OIL AND GAS PRODUCTION!

WHEN YOU buy a log, what are you buying? Information, of course . . . information as to the best place to perforate and frac in order to bring in the biggest volume of oil or gas. And the log which can best provide this information should be the one to use. You owe it to yourself, your company or your associates to get the most out of your logging investment.

That's why we suggest that you investigate Frontier's ISOTRON . . . the advanced 3-curve nuclear log that reads through casing to give you MORE INFORMATION AT NO EXTRA COST!

A FIELD-PROVEN LOGGING TOOL

Let's get something straight to start with: we do not claim that ISOTRON is the *ultimate* answer to all logging problems. In all probability it will take many more years of intensive research and experiment before a tool is developed that will infallibly locate and identify oil or gas regardless of conditions or circumstances.

We DO claim, however, that Frontier's ISOTRON will do a BETTER job of explaining the mysteries of your drilling formation . . . provide 33⅓% MORE useable information on which to base a successful completion. In over 1500 field logs,

MORE you have, the BETTER your chances!

ISOTRON'S batting average is .820 successful completions. It has proved extremely valuable in the re-evaluation of plugged wells or low producers. IN MANY INSTANCES, as a result of additional information which only ISOTRON can provide, OLD WELLS HAVE BEEN SUCCESSFULLY RE-COMPLETED FOR VOLUME PRODUCTION!

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In addition to the natural gamma and hydrogen curves which constitute the ordinary gamma ray — neutron log, Frontier's ISOTRON employs a third curve based on the response of chlorine to neutron bombardment. By normalizing through known saltwater zones of varying porosities where both hydrogen and chlorine are present, a median response to both elements is established and the two curves made to coincide. Subsequently, the curves will continue to coincide through all zones *except* where (a) chlorine concentration drops appreciably, a valid indication of oil saturation, or (b) fluid saturation decreases, denoting positive gas saturation. In either case separations occur which define the ratio of oil or gas to water, based upon the porosity reading provided by the natural gamma/hydrogen curves.

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During the development of ISOTRON and in subsequent field use, cost was a deterring factor to its widespread use. It was necessary to go down-hole twice to obtain the complete data, causing expensive on-the-job delay and tie-up of completion services. But we've solved the problem. Now, Frontier's ISOTRON does its job in ONE TRIP INTO THE HOLE! With the resultant savings in time-and-operational costs, ISOTRON can now be offered at a price competitive with ordinary logs.

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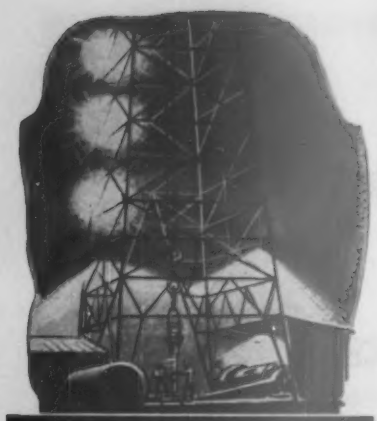

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35 KW, 115/208 volt AC diesel. Remote start.

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Potts, who has been transferred to Calgary as division sales manager.

Other personnel changes in Hughes' Canadian organization include the appointment of R. R. Brownridge as regional sales coordinator at Calgary, and W. E. Buchan as regional engineer, also at Calgary.

W. M. Ensign is appointed

...sales - service manager of Marsh Instrument Co., Skokie, Ill., division of Colorado Oil & Gas Corp. For 11 years he had been assistant sales manager of Marsh Heating Division. In his new position, Ensign will manage sales service in connection with all Marsh products. He was with the engineering firm of Holabird & Root before joining Marsh.

Dean Hill Corp. is new name

...of the former Dean Hill Pump Co., Inc., announces Nelson G. Johnson, president of the Indianapolis concern. Founded in 1890 as Hill Machine Works, the company moved from its Anderson, Ind., birthplace to its present location 16 years ago. Sales offices are at Indianapolis, New York, Chicago, and Los Angeles.

English firm to manufacture

...Born heaters under an agreement concluded between Born Engineering Co. of Tulsa and H. & E. Lintott, Ltd.

Under the agreement, H. & E. Lintott, Ltd., will sell, manufacture, and service Born heaters to the petroleum and chemical industries in the Sterling area. The first Born heaters sold by the English company were to Monsanto Chemicals.

Harold Born, partner and general manager of the heater-manufacturing firm, made an inspection trip to Europe recently to visit the manufacturing facilities of H. & E. Lintott, a member of Ayling Industries Group at Horsham, Sussex, as well as other Born installations in Europe.

Walworth Co. makes known

...an exclusive licensing arrangement with Canada Iron Foundries, Ltd., Montreal, for the manufacture and sale in Canada of Walworth's industrial bronze, iron, steel, plastic, and lubricated plug valves. In recent years Canada Iron has handled a limited number of Walworth valves for sale in Canada.

STOP H_2S CORROSION BEFORE IT STARTS!

• The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

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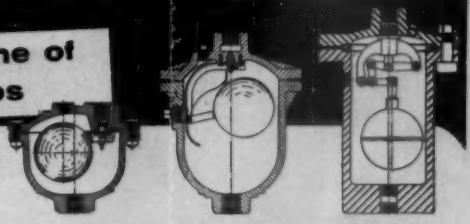

Corrosion-Resistant Parts—stainless steel standard . . . also available in nickel, monel, various grades of stainless, and other weldable materials which can be fabricated, cast or forged.

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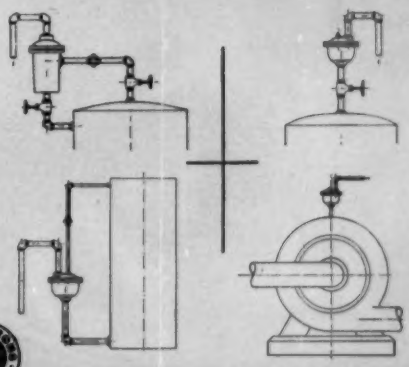

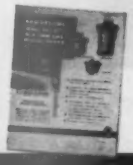

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CUT OPERATIONAL COSTS WITH AN ON-THE-PREMISES LAUNDRY.

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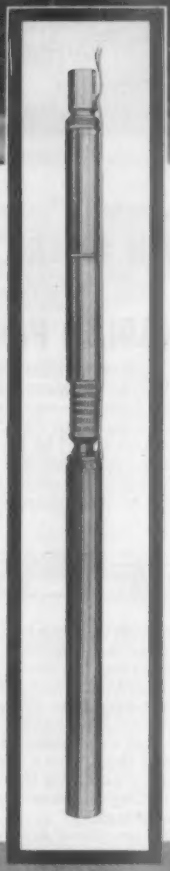
OVER 300 REDA PUMPS PROVIDE LOW-COST PRODUCTION FOR GREEN COUNTY, KENTUCKY

Photo Courtesy E. D. Blanchard, Aqua Well Drillers, Chattanooga, Tenn.



Small REDA Units Make Profitable Producers of High Water/Oil Ratio Wells

Using Reda Submergible Pumps, Green County producers have been able to profitably pump wells, proven unprofitable when other types of pumps were used.

The wells are shallow, producing from 350 to 600-foot depths. They have an average water/oil ratio of 10 to 1, with some as high as 100 to 1.

Small size Reda units were introduced into the field, and quickly replaced many other types of pumps of excessive cost and size.

TYPICAL REDA INSTALLATION:

PUMP: 34 stage, type A18E for 4-inch I. D. or larger casing
MOTOR: 3 H. P., 230 volt, single phase
FLUID LIFT: 600 B/D of fluid from 500-ft. depth setting
POWER COST: Approx. 67¢ per day (based on cost of 1¢ per KWH)

This is but one of many examples where experience-proven Reda units have proved to be the most efficient, most economical pump for the job!

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Drillers explore St. Lawrence possibilities

A VAST 60,000-acre potential oil and gas area may exist in the province of Quebec on the north shore of the St. Lawrence River in the Cape Madeline-Three Rivers sector. Located nearly midway between the cities of Montreal and Quebec on what may prove to be one of North America's most strategic shipping lanes, the prospect is being developed by Seaway Gas & Oil, Ltd., Montreal.

Robert McMaster & Sons, Ltd., Caledonia, Ontario, were working below 300 ft. for Seaway after completing a difficult fishing job on the previous hole in this St. Lawrence Lowlands locale. The present program is the result of former geophysical work, gravity-meter surveys, and core-hole drilling.

President of Seaway is C. E. Parish who also heads Almega (Quebec), Ltd., a wholly owned subsidiary. A successful development campaign could mean a ready market because of its central location.

Ontario firm to make rotary rigs

Rights have been secured by Gardner-Denver (Canada), Ltd., Woodstock, Ont., to manufacture Mayhew rotary rigs for the Canadian market. Mayhew is a long-time maker of portable rotary equipment for geophysical exploration, core-drilling, and production wells.

John H. Perish is field engineer for Gardner-Denver. In the past few years eastern Canada has experimented a widespread flurry of both development drilling and accelerated exploration for new reserves.

Proximity to available markets has been cited as one of the chief reasons for the intense interest in eastern Canada's development of greater reserves. Greater availability of rotary rigs will not only speed up exploitation programs but also would insure deeper probing for gas and oil.

Boost proposed in federal drilling bonds

The Department of Interior has announced a proposal to raise drilling bonds from $5,000 to $10,000 to oil and gas lessees where the Government controls the minerals. The change is intended to protect the surface owners from any damages resulting from oil and gas operations. The rise in bonds is considered reasonable, according to Edward Woozley, director of the Bureau of Land Management, due to increasing costs of land improvements.

This proposal will be published in the Federal Register. A 30-day period from date of publication in the Register will be allowed for filing of comments, protests, and appeals.

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USED AND RECOMMENDED

. . . *especially* under conditions where DRAG, TORQUE, OR THE HAZARD OF STICKING DRILL-PIPE, LINER AND CASING are encountered.

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have proved the effectiveness, versatility and trouble-free application of

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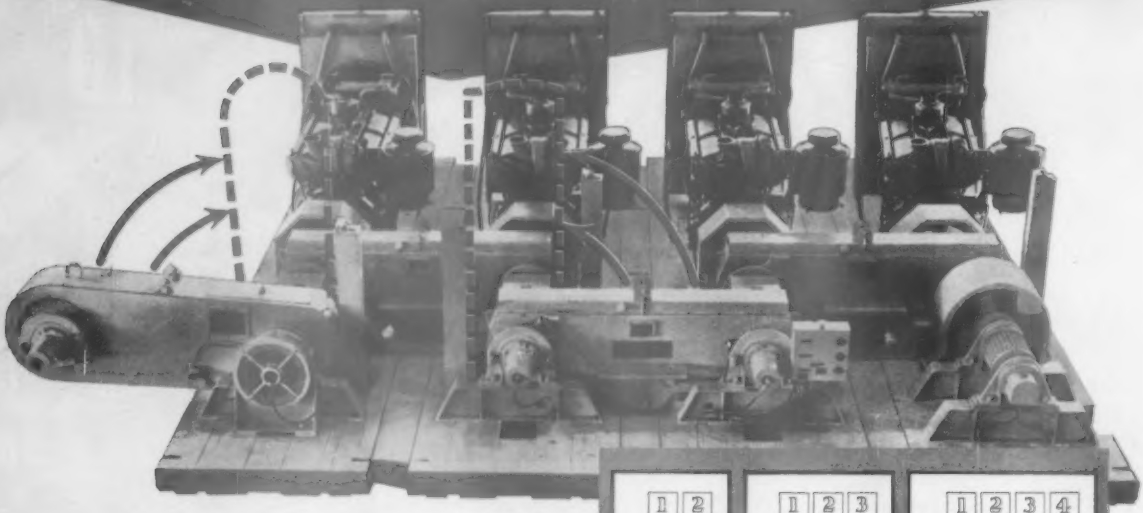

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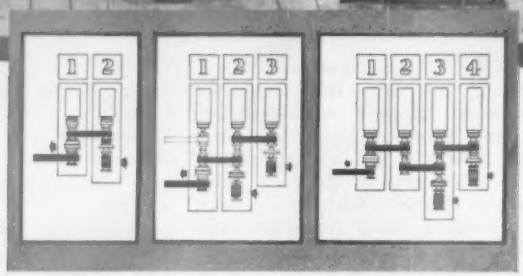

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The Mid-Continent AE Rig Drive is a development of the Swinging Compound, a patented Mid-Continent feature. Swinging Compounds simplify the addition of engines, and makes possible moves without opening compound cases, draining oil, or "breaking" chains. Simply by pivoting Swinging Compounds to a vertical locked position, the units are ready to move to the next location. Designed for two, three, or four engines totaling 800 to 2400 horsepower, all compound case assemblies are identical for any combination. There is an AE Rig Drive to match your drilling requirements. Contact your Mid-Continent representative for complete information.

Scheduled for shipment to Argentina, this rig is equipped with a Mid-Continent 3AE Rig Drive including Swinging Final Drive, and Swinging Pump Drives for the maximum in flexibility and quick rig-up.

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New Ontario rig line

A supplier—Tillsonburg Pipe & Supply Co., Ltd., Tillsonburg and Smith Falls, Ont.—has been named as distributor for Bucyrus-Erie drilling equipment in the Quebec and Maritime areas. G. D. Willits, branch manager of the Smith Falls division, will add the Bucyrus-Erie 1000-R rotary rig to the line of cable tools the firm handles.

Eastern Canada, long a stronghold for standard-tool operations, is undergoing an influx of new rotary equipment for the deeper tests now being drilled. Tillsonburg has handled Bucyrus-Erie cable tools in the Ontario area for many years.

Watson moves up

IT HAS been announced by Rowan Drilling Co., Inc., Fort Worth, that Richard A. (Dick) Watson has been promoted from chief engineer to assistant division superintendent of the firm's Gulf Coast division, New Orleans.

His father worked for Humble Oil & Refining Co. and Watson was raised in the oil fields.

In 1941 he enrolled at Texas A & M College, and later transferred to Rice Institute, where he received his engineering degree in 1948.

While attending Rice, Watson worked for Rowan during the summer months as a roughneck in 1946 and 1947. He joined the company full time in June 1948 as a floor man on a West Texas rig. A year later he went to the Gulf Coast division as an engine man and served on each one of Rowan's barge rigs before he was made division engineer.

Two and one-half years later he was tapped for chief engineer and sent to Fort Worth. His wife and two sons have joined him in New Orleans where the family will make their home.

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PIPE LINE
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"DEAD MEN THAT HOLD!"

Grip-Tite Pipe Line Anchor Assembly is designed for protection to pipe coating and for permanent hold-downs of all kinds of pipe line construction. Costs only a fraction of cast iron or concrete weights. No heavy equipment needed for installation. They save time, labor and afford protection from heavy weight damage during installation. *Thousands in trouble-free use today!*

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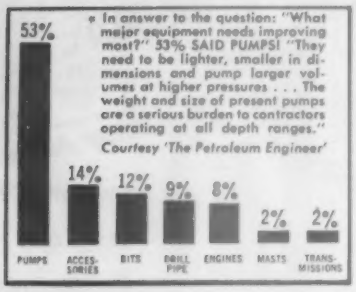
Proper selection of slush pump makes this warning obsolete . . .

"The Weight and Size of Present Pumps are a Serious Burden To Contractors Operating at All Depth Ranges"*

Field tested chain and sprocket slush pumps point the way to faster drilling at low cost.



* In answer to the question: "What major equipment needs improving most?" 53% SAID PUMPS! "They need to be lighter, smaller in dimensions and pump larger volumes at higher pressures . . . The weight and size of present pumps are a serious burden to contractors operating at all depth ranges."
Courtesy 'The Petroleum Engineer'

There is no need to haul around all that dead weight, it costs money to move. A chain and sprocket is about half the width of a gear of equal torque capacity, and so is much lighter in weight than a gear drive. A Wilson Titan Pump weighs about 28 pounds per horsepower rating, while the average weight of 12 pumps in the same class is 56 pounds per horsepower. A Wilson Giant Pump weighs about 33 pounds per horsepower, but the average of pumps in its class is still about 47 pounds per horsepower.

Less space too: Since the chain and sprocket drive is less weight, it stands to reason that the pump is smaller. And any part of the pump is completely accessible.

Crankshafts: Old fashioned pumps have eccentrics, instead of true cranks. And these manufacturers will tell you that a crankshaft cannot be built which will not break. Wilson has never broken a crankshaft, in five years of operation. The Wilson crank is U. S. Patent Number 2,899,742.

How's 100 S.P.M. for speed. This is where the proof of the design pays off. Volume and pressure are the answer to any real questions regarding the pump operation. Following this paragraph are a few instances of how Wilson pumps do operate.

100 Strokes a Minute: Working in the rugged mountain desert country south of Farmington, New Mexico, the Summit Drilling Company is using a Wilson Giant 7½ x 14" Slush pump drilling to the Bisti Formation. Under everyday operations the pump is equipped with 5½" liners, holding 1050 pounds pressure, *at 100* strokes a minute. Frankly, we never heard of anyone running a slush pump this fast before, but seeing is believing. If you doubt our word on this, and frankly, we would doubt most anybody on such a statement, call Reese Williamson at Farmington, New Mexico, Davis 5-5714. Reese and his partner, Tom Cotton have cut about two days off the drilling time on these wells with the Wilson Giant Pump.

Take out that knock, too: It goes without saying, that such a record would not be possible without a Wilson Suction Flow Equalizer on the intake of the pump. Without this apparatus, the pump would pound like a moving loaded box car with a flat wheel. It took several years of research to develop the Suction Flow Equalizer, along with the revolutionary design of the Wilson Pump. But now that we have this device, we can greatly increase the speed of a pump, thereby reducing the weight per horsepower. You could not drive an automobile without springs and shock absorbers, except at very slow speeds. Similarly you cannot drive a pump at high speeds, without absorbing the terrific impact of the mud as it hits the end of the pistons and the valves. Modern drilling calls for high pressures, held at smooth levels.

What about efficiency? The Wilson Pumps have a completely streamlined fluid end, which makes the rapid flow of the mud easier. Also a chain drive does not take nearly as much horsepower as a gear drive. Any engineer can consult his handbook to prove this. So, we find that with the same horsepower, the pump either produces an average of about 15% more pressure, or about 15% more vacuum on the engines. Frankly, we think this is also caused by the smooth flow of the mud induced by the Suction Flow Equalizer operation. But anyway, it always happens, with either a corresponding reduction in fuel costs, or an increased rate of bit penetration.

Saves $1,500.00 per well. Back in December, we had a letter from one of our Contractor Customers at Oklahoma City, Pete MacKellar, who reported that the Wilson Giant Pump "With the two days savings on time, plus the fact that we have 20,000 pounds less weight to haul, has enabled us to make an estimated saving of $1,500.00 per well." Pete's phone at Oklahoma City is Regent 6-5261, if you want to know just how well his Wilson Giant Pump runs.

Contractor buys four Wilson Giant Pumps: One of the most active contractors in the business right now is the FWA outfit of Wichita Falls. We know this group is right in our back yard, but they are a bunch of operators with plenty of savvy in how to run a drilling rig. They run their four Wilson pumps at 75 to 85 strokes a minute most of the time, with pressures at about 1750 pounds. As one of their veteran toolpushers says, "It's the smoothest operating pump that our crews have ever used."

Pump on world's deepest slim hole: In the March 1959 issue, "Petroleum Engineer" carried an article entitled "The World's Deepest Slim Hole." A Wilson Titan 8" x 18" pump was used almost exclusively on this well.

Mud pressures ran to 3500 pounds for many days. The mud weight was about 19 pounds to the gallon. Try this out on your pump, and see how it performs! Most pumps for such service weigh twice as much as the Wilson Titan, but they pound at high speeds. Of course, if those pumps had a Wilson Suction Flow Equalizer, it would help them a lot.

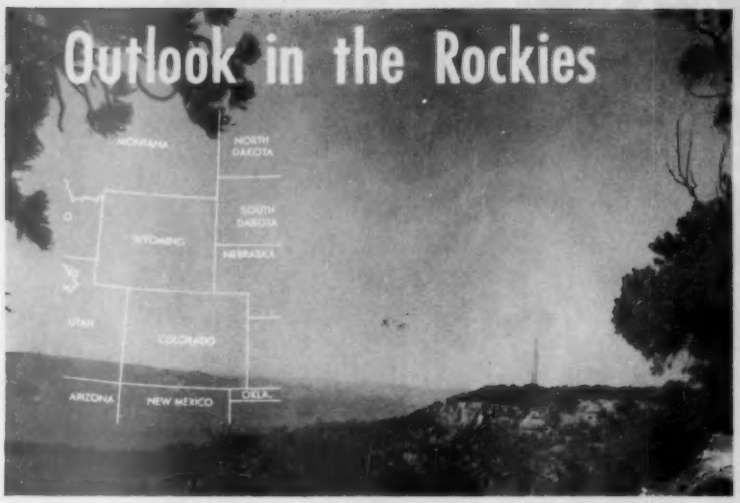
Let's Look at the Cost: Wilson pumps cost about 65% of the amount charged for an ordinary slush pump of the same horsepower rating. Unfortunately most contractors today buy their pumps not on the quality of the pump, but on the amount of the trade-in they get for their old pump. Right now, there is a very poor market for *used* slush pumps. This puts the contractor in the position of taking an old fashioned product because he gets a high trade-in for his old pump. Then he is not able to compete price-wise against the users of Wilson pumps. No one would buy a 1940 model car *new* in 1959. Neither would a contractor buy a gear driven drilling rig. Why not buy a 1959 model chain driven pump on your next purchase and enjoy the quality and performance of a modern pump?

John W. Wilson

WILSON MANUFACTURING COMPANY

Wilson

WICHITA FALLS, TEXAS



Will the Rockies set another record?

BY JOHN C. McCASLIN

EACH EXPLORATORY year sees new drilling records set in the Rocky Mountain empire. Signs point to a possible new record again this year barring setbacks due to the steel strike. At year end there should be nearly 5,000 wells on the books. Wyoming and Nebraska are currently way out front in the drilling race, while the other states are not too far behind last year's totals.

Exploratory paths widen . . . Throughout the mountain domain from New Mexico to Montana both old and new wildcat fences are falling by the wayside.

. . . In Wyoming. This state of many basins is fast becoming a major exploratory arena. This year's trek is into the Green River, Wind River, and Powder River basins. Next year's campaign will feature the same areas.

● Green River is at the height of its wildcat career. Gas has always been the chief target here, but oil is now entering the scene. Cretaceous rocks are paying a handsome reward to wildcatters in new fields . . . West Desert Springs, Figure Four Unit, Stateline Unit. Gas exploitation is forging ahead at a feverish pitch throughout the basin. The outlook for next year in Green River is the best yet. A recent Almond Cretaceous oil find in West Desert Springs will turn many thoughts to oil for Green River and new prestige for the most promising basin in the Rockies.

● Wind River basin, nearly forgotten by explorers in the past few years, is back in line for wildcat prominence. Recent Tertiary and Upper Cretaceous discoveries along the basin's unexplored northern and northeastern brink put Wind River in a lofty position for coming wildcat interest in Wyoming. First Lance Upper Cretaceous oil production at Waltman Unit, rapid development of new Tertiary oil and gas in the Lysite and Lost Cabin units, and further plans for Cooper Reservoir and Badwater Unit should lift this basin high next year.

● With drilling already at its fastest clip since the Weston County boom, look for even bigger things in northeastern Powder River basin. Three major oil finds joined the ranks this year and another is being completed. Rozet, Timber Creek, and Miller Creek are the new ones, while another Pennsylvanian field is opening northeast of Donkey Creek, the sire of this push which began in 1957. Step-out drilling throughout the Newcastle, Dakota, Lakota, and Pennsylvanian areas of Crook and Campbell counties enhances northeastern Wyoming's bright reserve outlook. Pennsylvanian Minnelusa and Cretaceous rocks will get a thorough going over for a long time to come. Even the old fields like Thornton and Osage are being reworked.

. . . In Williston. Montana's portion of the Williston basin has its most important discovery since Outlook, while North Dakota's Dunn County has its first oil production. Mobil Oil Co.'s Mississippian prospect in Sheridan County, Montana, 30 miles from production, and Amerada Petroleum Corp.'s Dunn County find in North Dakota, have great bearing on Williston exploration. The Montana strike will revive the oil search in the remote central areas of the basin, while the Dunn County hit suggests a return to pre-Madison exploration for North Dakota.

South Dakota is currently in the midst of its busiest drilling period since discovery of oil at Buffalo several years ago. Harding County remains the big target. This county is on the southeastern extension of the long Cedar Creek anticline of Montana fame. There are 15 oil producers in and around Buffalo . . . all having production from Red River-Ordovician rocks. A recent extension to the producing area in Harding County will go a long way toward placing South Dakota up front next year in the Williston drilling race.

. . . In Uinta - Piceance. There are definite exploratory signals on the horizon for this erratically active province in western Colorado and northeastern Utah. Two recent Niobrara-Cretaceous oil finds in western Colorado's Piceance Creek basin plus a new Mesaverde Cretaceous gas discovery on Buzzard Creek Unit in Mesa County will force another much-needed look into the untouched potential of the western slopes of Colorado's Rockies. The Mesaverde gas hit is 4 miles from any production.

. . . In Four Corners. Expect virgin pays and virgin corners of the region to be explored as a result of Utah's second Mississippian producer at Northwest Lisbon and Arizona's first Mississippian production in Apache County. The ever-growing regard for the Dakota Cretaceous as a major oil and gas bait for the wildcatter's hook in the San Juan basin portrays the new niche that this southwestern province is carving for itself in exploration.

Delta Rig, drilling with air in Pennsylvania.

THE BEST YEARS IN OIL WEREN'T FREE!

Without profit, the blacksmith would still be building our drilling rigs. In the hundred years since the birth of the oil industry, triumphs of oil technology have been made possible by profits . . . the lifeblood of our free economy . . . profits earned by increased efficiency and better products at lower prices.

In 1859, Edward Drake drilled 69½ feet in three months. In the same part of Pennsylvania, each Delta rig now drills more than a hundred times this depth in twenty days!

Although the drilling contractor drills over 95% of the wells, has millions invested in equipment, tools and skilled personnel, he has been operating without profit in the last two or three years. Unless conditions improve, the oil and gas industry will find one of its most competent and indispensable hands severely crippled and incapable of carrying its part of the load. Only through profits can the drilling contractor modernize and replace his equipment and maintain a skilled and experienced organization.

The demands of the petroleum industry for economy in drilling can be realized only through drilling contractors of acknowledged ability and integrity, properly equipped and adequately financed.

For over a quarter of a century, Delta Drilling Company and its subsidiaries have served with integrity and efficiency in this country and in foreign fields. Delta's financial structure permits flexibility in its contracts . . . including participating interests and foreign currencies.

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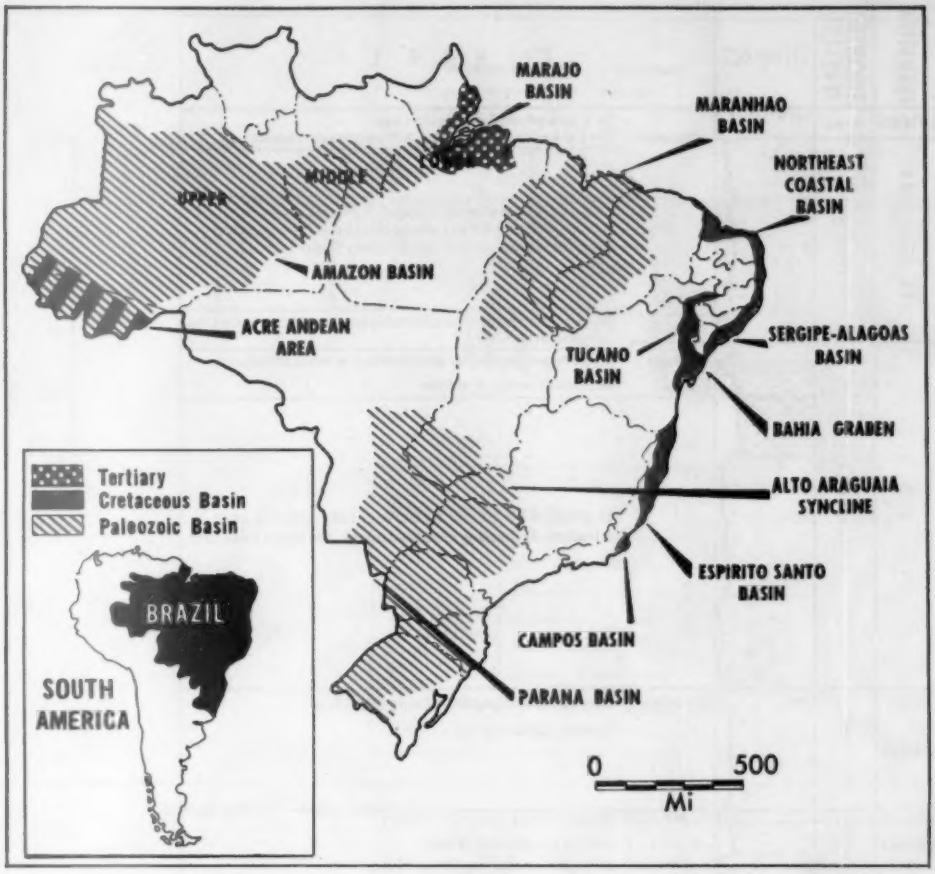
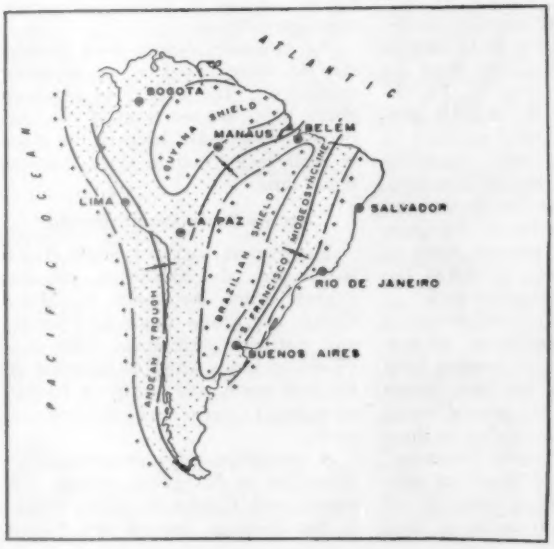


MORE than a fourth of Brazil's area constitutes sedimentary basins. Fig. 1.

What are the chances for oil in the sedimentary basins of Brazil?

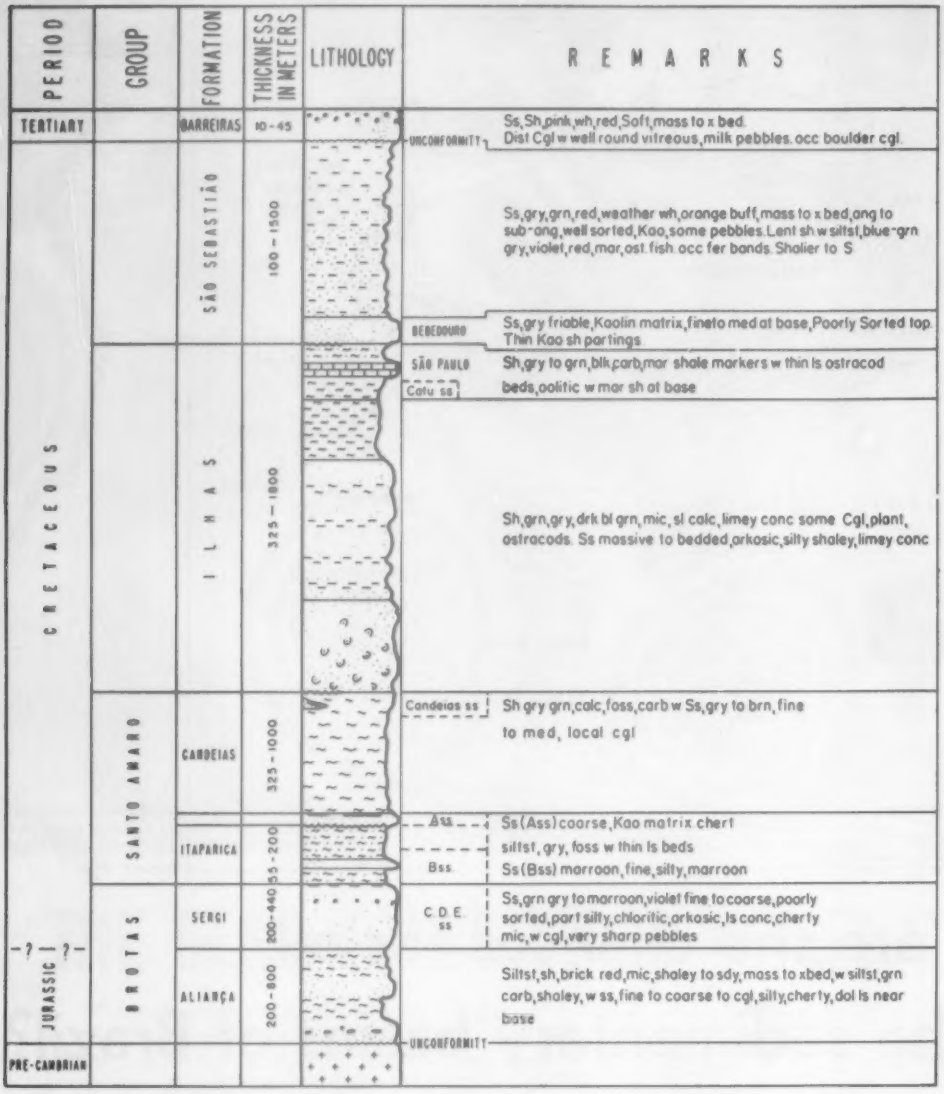
BY WALTER K. LINK
Exploration Department,
Petroleo Brasileiro S.A.,
Rio de Janeiro, Brazil



CRYSTALLINE framework of South America. Fig. 2.

BRAZIL has an area of 8,511,000 sq. km. (3,244,246 sq. miles). Of this area approximately 3,200,000 sq. km. are sedimentary basin areas of various kinds or 27% of the total area of Brazil (Fig. 1). There are three Paleozoic basins: Amazonas with an area of 1,200,000 sq. km., Maranhao with 600,000 sq. km., and Paraná with 1,200,000 sq. km. The Cretaceous basins of Northeast Brazil cover 40,000 sq. km., Sergipe - Alagoas 16,000 sq. km., Tucano 40,000 sq. km., Reconcavo 15,000 sq. km., and others 90,000 sq. km. The only com-

This is a condensation of a paper presented at 1959 Fifth World Petroleum Congress.


PERIOD
GROUP
FORMATION
THICKNESS IN METERS
LITHOLOGY
REMARKS
TERTIARY
BARREIRAS
10 - 45
Ss, Sh, pink, wh, red, Soft, mass to x bed.
Dist Cgl w well round vitreous, milk pebbles, occ boulder cgl
UNCONFORMITY
CRETACEOUS
SÃO SEBASTIÃO
100 - 1500
Ss, gry, grn, red, weather wh, orange buff, mass to x bed, ang to sub-ang, well sorted, Kao, some pebbles. Lent sh w siltst, blue-grn gry, violet, red, mar, ost. fish, occ fer bands. Shalier to S
BEBEDOURO
Ss, gry friable, Kaolin matrix, fine to med at base, Poorly Sorted top. Thin Kao sh partings
ILHAS
325 - 1800
SÃO PAULO
Sh, gry to grn, blk, carb, mar shale markers w thin ls ostracod
Catu ss
beds, oolitic w mar sh at base
Sh, grn, gry, drk bl grn, mic, sl calc, limey conc some Cgl, plant, ostracods. Ss massive to bedded, arkosic, silty shaley, limey conc
SANTO AMARO
CANDEIAS
323 - 1000
Candeias ss
Sh gry grn, calc, foss, carb w Ss, gry to brn, fine to med, local cgl
Ass
Ss (Ass) coarse, Kao matrix, chert
ITAPARICA
55 - 200
siltst, gry, foss w thin ls beds
Bss
Ss (Bss) marroon, fine, silty, marroon
BROTAS
SERGI
200 - 440
C.D.E. ss
Ss, grn gry to marroon, violet fine to coarse, poorly sorted, part silty, chloritic, arkosic, ls conc, cherty mic, w cgl, very sharp pebbles
JURASSIC ? ?
ALIANÇA
200 - 800
Siltst, sh, brick red, mic, shaley to sdy, mass to xbed, w siltst, grn carb, shaley, w ss, fine to coarse to cgl, silty, cherty, dol ls near base
UNCONFORMITY
PRE-CAMBRIAN

STRATIGRAPHIC section of Reconcavo basin shows great variations in thickness of various sedimentary members. Fig. 3.

mercially productive basin today is the Reconcavo, a Cretaceous basin.

The Geological Framework

The geological framework of Brazil is controlled by the Brazilian and Guiana Precambrian shields. The large Paleozoic sedimentary basin of South Brazil, Maranhao, and the Amazon are comparatively shallow, but large depositional areas that seem to have been interconnected and which were caused by the shield sinking during Paleozoic time. The small basins on the east and north margins of Brazil, such as Sergie-Alagoas, Espirito Santo, South Bahia, and Campos, are small half-graben basins that received sediments during Cretaceous and Tertiary times. The Reconcavo and Tucano basins of Bahia are true graben basins of Cretaceous, and at earliest Jurassic time.

The Paleozoic sedimentary basins of Brazil were probably all connected with the main Paleozoic trough of the Andean geosyncline (Fig. 2). The dividing line between the Andean geosyncline deposition was probably a subdued crystalline ridge extending from Iquitos, Peru, through Eirunepe, Cuiaba, and Corumba in Brazil, and south through Asuncion in Paraguay to slightly west of Buenos Aires in Argentina. This arch is called the Asuncion, Corumba-Iquitos arch.

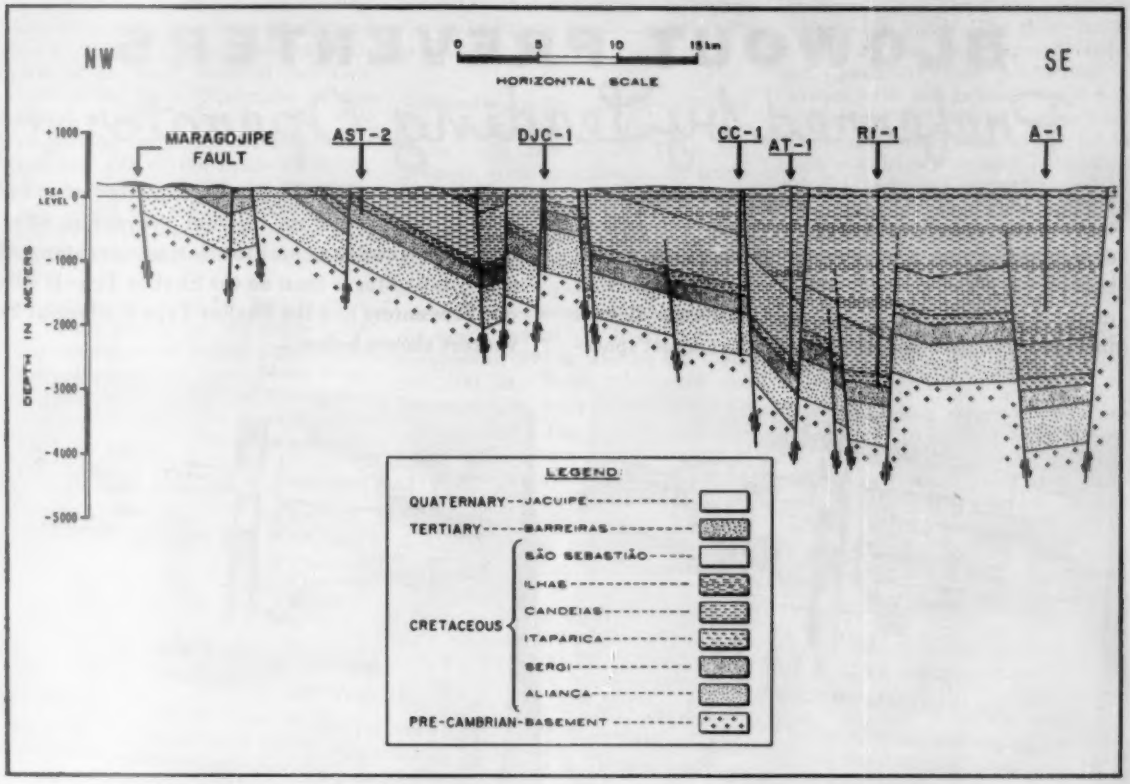
In Brazil, Paleozoic sedimentation took place in comparatively shallow but widespread sea arms coming from the Andean trough. The axis, shown on Fig. 2, indicates the general trends of these arms. Sedimentation in these basins indicates a "gentle breathing" of the eastern part of Brazil, of slow uplift and slow sinking, through all time since the Cambrian or at least since pre-Silurian.

No mountain ranges were formed due to folding and active orogenic movements. The crystalline areas of Brazil today are remnants of old land masses which have been in the stage of near peneplanation since Precambrian time.

Paraná Basin (South Brazil)

The Paraná basin of South Brazil has an area of 1,200,000 sq. km. and extends from the states of Minas Gerais and Goias south to Uruguay and northern Argentina. This is a Paleozoic basin which is bounded on the east, north, and northwest by outcropping crystalline Precambrian rocks.

A crystalline ridge extending from Asuncion in Paraguay, through Corumba and Cuiaba in Mato Grosso is the dividing line of the Paraná



GENERALIZED CROSS-SECTION shows seven oil fields in Reconcavo basin. Fig. 4.

basin from the Andean geosyncline to the west. From the Corumba arch the sedimentts dip eastward, and from the crystalline outcrop areas in Rio Grande de Sul, Paraná, Sao Paulo and Goias the rocks dip westward. Only along the crystalline margins can sedimentary rocks of Paleaozoic be seen as two-thirds of the basin is covered by lava flows of Jurassic age.

An outcrop band roughly 100-km. wide in the states of Paraná, Santa Caterina, and Rio Grande do Sul exposes the entire Paleozoic section from the Lower Devonian sandstone through the Permian, the Juro-Triassic, and the Jurassic lava flows, on the east side of the basin. On the west side an outcrop band from east of Asuncion to Cuiaba also exists.

Structural setting . . . The Paraná basin today is primarily a syncline. Two apparent arches cross this syncline from east to west. These are the Ponta Grossa arch in the State of Paraná, which begins with a crystalline bulge and plunges below the lava flows to the west, and the Rio Grande do Sul arch, which does the same thing.

Aside from these noses, which are broad and gentle, the only structural feature of any consequence is the Lages Dome, in the State of Santa Catarina. This dome is caused by igneous intrusion.

In the outcrop belt, on the east side of the basin, there is no evidence of folding and important faulting. There are, however, many minor normal faults resulting in tilted normal fault-block type of structural condition. Many of these faults and fissures are filled with intruded diabase and these intrusions leave the impression that the great lava flows to the west emanated from the many faults, cracks, and fissures and not from a few major sources.

The great amount of normal faulting is quite likely the result of subsidence within the basin during the various geological epochs and a slight raising or lowering of the crystalline shield massifs.

Oil indications . . . There are numerous surface oil indications in the outcrop zone in the states of Sao Paulo, Paraná, and Sta. Catarina. In Sta. Catarina many of the indications are in vugs of the lava flows. The best indications of oil in the Paraná basin are in the State of Sao Paulo where the Botucatu is a tar sand over a large area.

Many of the other oil indications are associated with the Irati, a thin bituminous shale section in the Lower Permian. The Irati formation is being considered as a possible shale-oil source.

Wells drilled . . . About 40 wells have been drilled for oil in the states of Sao Paulo, Paraná, and Santa Catarina. Dozens of shallow holes have been drilled exploring the shale-oil possibilities of the Irati. Many of the wells drilled for oil have penetrated the section to crystalline basement.

Minor shows of oil and gas were encountered in some of the wells. Several holes near Mallet, in the southern part of Paraná, got a few barrels of oil. No commercial fields have been developed.

1959 exploration program . . . Two surface geological field parties will operate the entire year. Two wildcats will continue to drill structural blocks in the outcrop area south of Ponta Grossa in Paraná, and three heavy rigs will drill stratigraphic holes on the lava cap in Sao Paulo, Santa Caterina, and Rio Grande do Sul.

The Maranhao Basin

The Maranhao basin (Fig. 1) has an area of 600,000 sq. km. and covers the greater part of the states of Piaui, Maranhao, and the northeast portion of Goias. On the east, south and west

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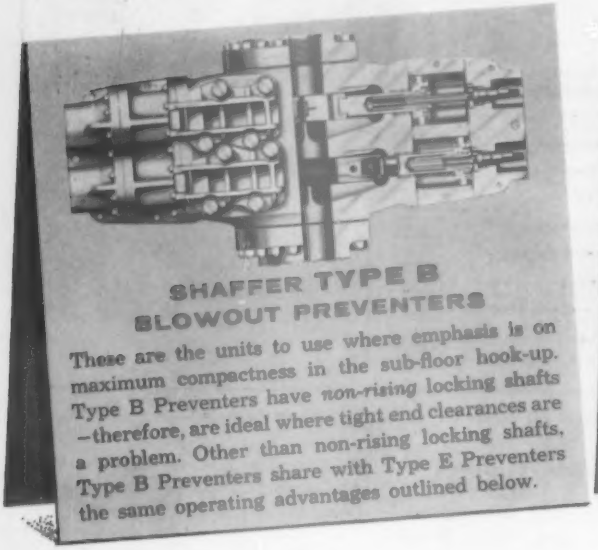
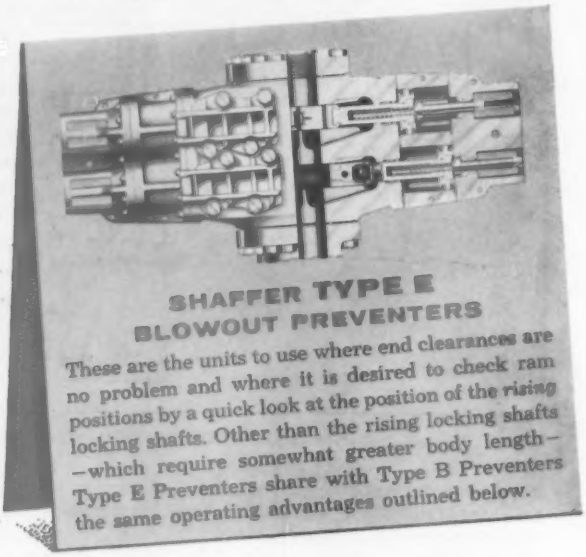


SHAFFER TYPE B BLOWOUT PREVENTERS

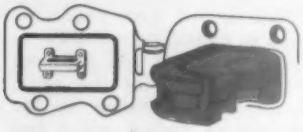
These are the units to use where emphasis is on maximum compactness in the sub-floor hook-up. Type B Preventers have *non-rising* locking shafts —therefore, are ideal where tight end clearances are a problem. Other than non-rising locking shafts, Type B Preventers share with Type E Preventers the same operating advantages outlined below.



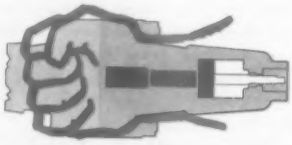
SHAFFER TYPE E BLOWOUT PREVENTERS

These are the units to use where end clearances are no problem and where it is desired to check ram positions by a quick look at the position of the *rising* locking shafts. Other than the rising locking shafts —which require somewhat greater body length— Type E Preventers share with Type B Preventers the same operating advantages outlined below.

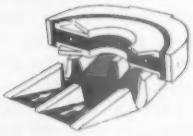
UNIQUE FEATURES BUILT INTO **BOTH** TYPE B AND TYPE E PREVENTERS



"SWING-OPEN" RAM DOORS: No need to dismantle Shaffer Preventers to change rams. With Type B and Type E Gates, you simply unbolt side-opening doors, swing open, change rams and bolt shut. It's quick and easy!



POSITIVE "IN-LINE" POWER DRIVE: There are no levers, yokes or complicated connections to jam... no "arm pockets" to clog with cement or mud... nothing to jeopardize quick ram operation when emergencies threaten!



QUICK-DRAIN RAM COMPARTMENTS: Steeply-sloped compartment bottoms drain sand and mud back into the well. Rams travel on raised guide ribs, high above any detrimental accumulations left by drilling fluids.

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it is bounded by Brazilian shield Precambrian crystalline rocks. Outliers of the crystallines also occur on the north side of the basin south of Sao Luiz and in the Serra Tiracambu on the northwest side. Paleozoic rocks outcrop along the crystalline margins on the east side of the basin where the dip is west 1° to 2°, on the south side where the dip is north, and on the west side where the dip is east. The basin is almost circular in outline.

Structure . . . Like the Paraná basin of South Brazil, the Maranhao basin has undergone no violent deformation since Precambrian time. There is no evidence of compressional folding and no long lines of normal faulting due to rapid sinking during the sedimentary deposition.

The faults which do exist are normal tension faults which are generally filled with diabase rock. The lava flows undoubtedly came up along these faults. Local domal uplifts occur, which are the result of diabase intrusion.

A buried arch crosses the basin from east to west, beginning with the crystalline outcrop south of Sao Luiz and probably tying in with the crystallines on the northwest side of the basin. This is called the Ferrer arch and the Paleozoic sediments thin and pinch out on it. It is north of this arch where the drill passes from Cretaceous to crystalline basement.

Oil indications . . . There are no bona fide oil seeps in the Maranhao. Drilling has encountered minor shows in the Cretaceous and in the Carboniferous.

Wells drilled . . . Fifteen wells have been drilled in the basin; seven north of the Ferrer arch and eight south of it.

1959 exploration . . . Exploration in 1959 consists of three surface geological parties, one seismograph, three gravimeter, and three wildcat rigs. One shallow stratigraphic rig is also in operation. About 200,000 sq. km. of aerial photographic survey and 40,000 sq. km. of aeromagnetic survey are also in progress.

The Reconcavo (Bahia Basin)

The Reconcavo basin of Bahia (Fig. 1) with an area of 15,000 sq. km. is the only commercially oil productive basin in Brazil.

The basin is outlined on the east and west by normal faults and structurally it is a graben. The confining east and west margins are composed of crystalline Precambrian rocks.

The sediments are probably entirely Cretaceous in age, but there is the possibility that the sediments immediately overlying the basement rocks are Jurassic.

Sedimentary rocks . . . The estimated Total sedimentary fill (Fig. 3) could be as much as 4,500 m. There are, however, great variations in the thickness of the various sedimentary members.

Jurassic (?). Immediately overlying the basement is a varicolored continental section known as Alianca that might be considered as Jurassic. On the north end of the basin it has a thickness of 200 m. and on the south end 800 m. These thicknesses are determined by wells drilled.

Cretaceous. The true Cretaceous begins with a sand member which is called the Sergi, and has a thickness of 200 to 400 m. This sand member is important because it marks the beginning of the marine sedimentary cycle and is also an important oil reservoir.

Above this member is a variable zone ranging in thickness from 55 to 200 m. known as the Itaparica, consisting of shales, sandy shales, and sand. This is the first true marine section in the basin.

On the top of this member lies the Candeias, which ranges in thickness from 325 to 1,000 m. It is a true marine shale which has a sandstone member at the base which is also a reservoir sand and carries oil. The Candeias itself has sand members in it, and in the Candeias field these lenticular sands are oil reservoirs.

The Ilhas, above the Candeias, ranges in thickness from 325 to 1,800 m. and is composed of carbonaceous green shales, siltstone, and silty shales and sandstones. The upper portion has thin oolitic and astracod limestones. It is a fresh to brackish-water deposit. This member is oil forming and sands within the Ilhas are reservoir sands.

The Sao Sebastiao formation overlies the Ilhas and has a thickness range of 100 to 1,500 m. It is primarily sandstone-siltstone clay deposit of shallow fresh to brackish water deposit.

Structure . . . The clearest picture of this basin can be obtained by studying the generalized cross-section (Fig. 4).

The bounding faults strike N. 35° East, and they fit in with the trend of the great marginal faults. The horst block Dom Joao oil field, on the west side of the basin, also trends N. 35° E. A strong trend of the Mata-Catu feature strikes N. 45° W. Oil accumulation, however, seems to be associated with the N. 35° E. fault system.

Oil fields . . . There are seven oil fields in the basin. The three major fields are Dom Joao, Agua Grande, and Candeias. Daily production in October 1958 was around 60,000 bbl. per day over half of which came from the Agua Grande field. Total oil in place is estimated around 1,200,000,000 bbl. and total recoverable oil by using secondary methods is estimated at 500,000,000 bbl.

Accumulation in Agua Grande and Dom Joao is on horst blocks. In Candeias it is stratigraphic, and in the other fields fault traps play an important role. The producing depths range between 200 to 2,000 m.

1959 exploration program . . . Four surface geological, five seismograph, one shallow structural drill, one intermediate stratigraphic, one deep stratigraphic, and eight wildcat rigs will operate in the Reconcavo in 1959. Aerial photographic mapping, reflying the entire basin, will also be done.

The Sergipe-Alagoas Basin

This coastal basin, situated in the states of Sergipe and Alagoas, has a land area of 20,000 sq. km. and a water area of about the same size.

The west side of the basin is bounded by a normal fault of considerable displacement, down thrown to the ast, bringing Precambrian crystalline rocks in contact with Cretaceous and Tertiary sediments. From the fault, the sediments dip to the ast for about 20 km. and then west. Marine seismograph surveys indicate about 20 km. of west dip terminating in a fault. The basin appears to be a graben, with a length of 150 km. and an average width of around 30 km.

Structure . . . Again in this basin nothing is found that looks like the work of compressional forces. Geophysical surveys indicate a great deal of normal faulting resulting in horst, grabens, and tilted normal fault blocks.

Oil indications . . . Surface oil indications were found many years ago, north of the city of Maceio. Oil indications have also been found in all the wells drilled in the Alagoas area, north, west, and southwest of Maceio. These oil indications are all in the Cretaceous sediments and particularly in Muribeca and the Sapucari of Lower and Upper Cretaceous. One well, Jequia 1, has produced about 2,000 bbl. of wax oil.

Wells drilled . . . A total of 20 wells for oil have been drilled in Alagoas. At this writing the deepest hole is 3,250 m. and still in sediments. In Sergipe 12 shallow holes have been

drilled, some of which were drilled for salt.

1959 exploration program . . . Two seismograph crews will work in 1959. Five wildcat rigs will continue drilling previously delineated seismograph prospects. One 2,000 m. stratigraphic and structural rig will drill 25 holes in areas which are unfavorable for seismograph operation and where bad records have been universal.

New Kansas book published

Just published is the second volume in a series which the Kansas Geological Society plans to present on oil and gas fields of Kansas. This volume is a compilation of 33 papers on fields west of Range 25 West with the author's name appearing on each paper.

The Research Committee of the Kansas Geological Society has assumed responsibility for selecting the fields included in this book. Selection was based on geological significance, economical important and geographical location. The Society plans to issue revised and supplementary field papers which will eventually give complete field coverage in later editions of this volume. The committee welcomes all criticism and corrections.

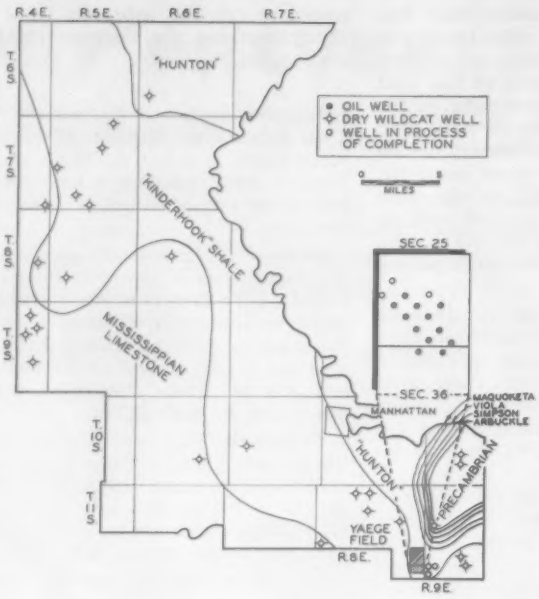
The first volume of oil and gas fields in Kansas was published in 1956 and covered fields of South Central Kansas. That volume was received with such overwhelming popularity that it was immediately evident that this Kansas Geological Society project was one which should be continued until all significant fields within the State of Kansas are compiled into a series of volumes.

Mississippian pool is opened in Archer County

A deep exploratory test in Archer County, North Texas, has opened Mississippian oil production, after finding the Ellenburger dry.

Gulf Oil Corp. 1 R. G. Jones (originally carried as 1 G. U. Baker), is 7 miles south of Windthorst townsite, in Section 1898, TE&L Survey. Potential test on the pump was 242 bbl. of 44° oil a day, from perforations at 5,344-84 ft.

The well was drilled to 5,836 ft., then plugged back to 5,418 ft. A drillstem test in the Ellenburger at 5,742-5,836 ft. produced a flow of gas at the surface but recovered mud and salt water in the drill pipe. Location is on a 265-acre lease, approximately 1 mile south of H. Burns-Jones field, but separated by a 5,417-ft. dry hole.



PREPENNSYLVANIAN areal geology and dry wildcats in Riley County with enlarged outline of Yaege field, the county's first producing area. Fig. 1.

Kansas hot spot attracts oil hunters

THE DISCOVERY of Riley County's first commercial oil well in June 1959 has prompted accelerated exploration in that county and the demand for available geologic data on the region has become insistent.

Much of the information needed by the driller and field geologist working in that county has been presented objectively with a minimum of interpretation in a booklet entitled "Petroleum Hotspot Report," published by State Geological Survey at Kansas. Names and addresses of regulatory agencies of the state are cited along with institutions supplying information pertinent to the county.

Geologic Setting

Riley County is situated on the eastern flank of the Salina basin where outcropping Pennsylvanian and Permian rocks dip gently to the west, displaying more than 400 ft. of topographic relief. Traced eastward in the subsurface from the western border of the county, the Pennsylvanian strata truncate successively older Paleozoic rocks until they lie unconformably on the Precambrian granites and gneisses of the Nemaha uplift.

Fig. 2 shows the characteristic "kicks" on an electric log from a well in the western part of the county where the stratigraphic section is more nearly complete. At present, all commercial oil production in the county is from Hunton strata, but oil shows in Pennsylvanian rocks suggest that these beds may yield commercial quantities of oil.

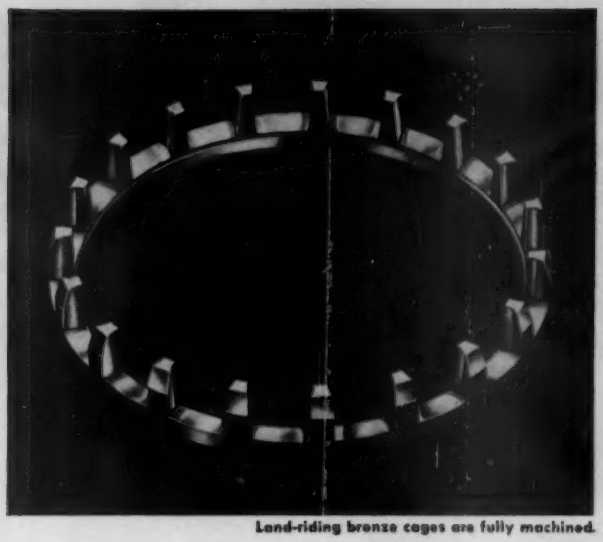
Wells of Record

In Fig. 1 all dry holes drilled in Riley County are shown and a pre-Pennsylvanian areal geologic map has

TABLE 1—RESULTS OF YAEGE FIELD PRODUCTIVITY TESTS

Well name	Interval tested	Gravity	Initial potential BOPD	Percentage of water
Cities Service Oil Co.:				
1 Yaege	(open hole)	35.1	36	0
2 Yaege	1,650-62	32.1	54	37
3 Yaege	1,690-1,704	34.9	64	70
4 Yaege	1,705-10	34.9	35	27
5 Yaege	1,710-20	32.1	31	22
6 Yaege	(open hole)	33.6	63	68
7 Yaege	1,668-96	33.5	56	0
8 Yaege	1,621-78	32.3	48	trace
1 Gehrt	1,622-49	33.5	67	3
1 Koepsel	1,676-95	32.3	37	tract

Center flange guides rollers to peak performance.



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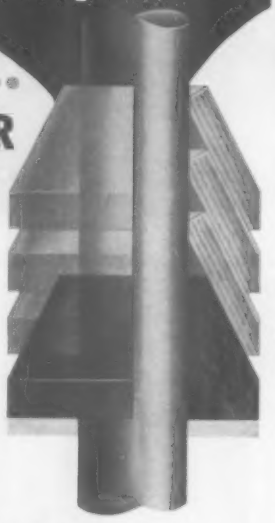

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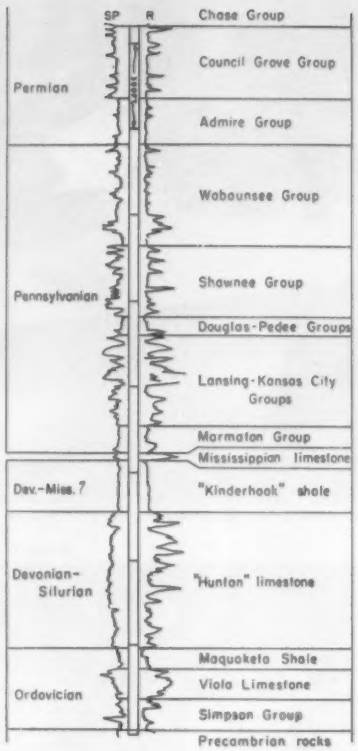

ELECTRIC LOG shows typical stratigraphic section, Riley County, Kansas. Fig. 2.

been constructed on the basis of their log records. Yaege field, reportedly discovered through surface studies, lies on the southern flank of a pre-Pennsylvanian high where porous Hunton rocks are unconformably overlain by Pennsylvanian strata.

Table 1 gives the results of official state productivity tests made on wells of the Yaege field.

West Texas Wildcat Makes Devonian Oiler

New Devonian production has been opened approximately 2 miles northwest of the northern end of Headlee-Devonian field in eastern Ector County, West Texas.

The new well is Texas Gulf Producing Co. 1 Barrow, which flowed 89.3 bbl. of 48° oil and 100 bbl. of water on 24-hour potential test. Gas-oil ratio was 1,713:1, tubing pressure was 400 psi. Operators drilled into the Devonian at 11,925 ft., or minus 8,921 ft., and completed from perforations at 12,224-300 ft.

No. 1 Barrow also had oil and gas shows in the Atoka section. A drill-stem test at 10,500-585 ft. recovered 30 ft. of free oil and 240 ft. of heavily oil and gas-cut mud.

Location is in the SE SE Section 27, Block 42, T1S, T&P Survey.

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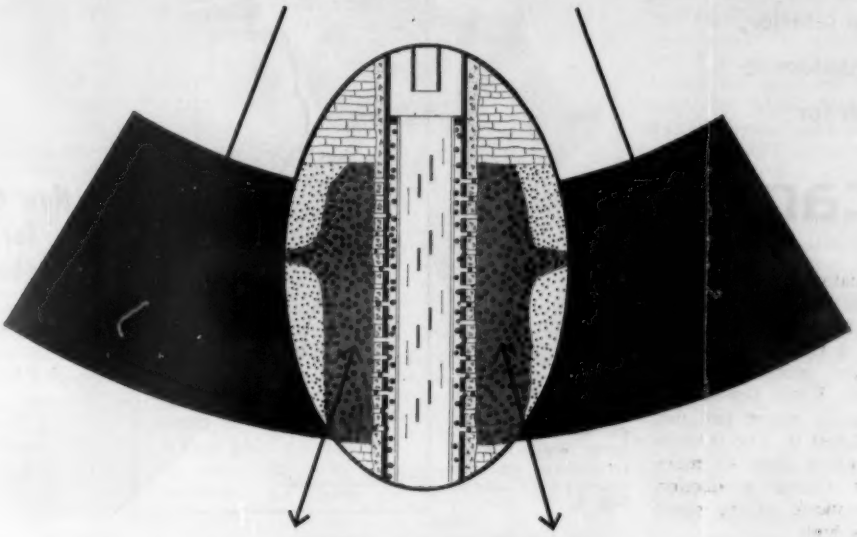

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Gabon's search for oil moves to the interior, adding momentum to the new push for

African oil

THE TINY Equatorial African country of Gabon on the west side of the Dark Continent may become a major oil producer as a result of a recent discovery in the interior. Mobil-SPAEF 1 Rembo Kotto flowed 340 bbl. of high-gravity crude per day from a pay at 2,000 ft. The remoteness of the discovery some 45 miles east of current Gabon production boosts the oil outlook of the small country to a new high.

Production . . . The Rembo Kotto discovery will add a substantial amount of oil to Gabon's steadily increasing crude production. Present oil output in the country is 15,000 bbl. Last year the output was 3,761,000 bbl., bringing the cumulative production in Gabon to 5,042,653 bbl.

REMBO KOTTO, newest addition to tiny Gabon's oil potential, will go a long way toward proving up the country's oil worth. Fig. 1.

. . . Gabon's producing areas. The country has four established producing fields: Pointe Clairette, M'Bega, Animba, and Ozouri. All of these are located on the Cap Lopez peninsula, jutting out into the Atlantic Ocean from the coastline. Rembo Kotto lies 45 miles southeast of the nearest production at Ozouri. The coastal fields produce from 2,000 to 4,000 ft. in Eocene rocks.

The current picture . . . Operators are deepening the Rembo Kotto discovery for a look at deeper horizons. The outcome of the drilling will be of keen importance to the future of exploration in the interior of the country.

The new MARK II Pumping Unit manufactured by Oilfield Equipment Corporation of Denver, Colorado. See it in operation at the International Petroleum Exposition in Tulsa.

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Rembo Kotto is in an area in which the French company, Ste. des Petroles de L'Afrique Equatoriale Francaise (SPAEF) formed partnership 1 year ago with two Mobil international affiliates. Mobilrex and Mobil Exploration Equatorial Africa, Inc., plan to put out 22.5 to 45 million dollars in the next 5 years to explore Gabon's oil potentialities. The two Mobil companies will share a 50% interest in any oil found with SPAEF who is the operator.

In 1958, SPAEF got the territory surrounding the production in the coastal fields, forming a partnership agreement with the two Mobil companies and a Royal Dutch-Shell affiliate. Mobil's companies have a 50% interest in 3,191,000 acres in Gabon; another 2,984,000 acres in the Congo, farther south. SPAEF kept a separate region around Pointe Indienne in the Middle Congo. The Shell-SPAEF joint agreement covers some 990,000 acres adjoining the Mobil Gabon acreage on the south.

Drilling . . . Both wildcat and field-well development drilling hit record highs last year in Gabon.

There were 84 wells completed. Operators completed 32 oil wells in existing fields along the coast, 1 gas, and 26 dry holes for a 56% success ration in development drilling. Wildcat success ratio was 12% with 3 oil finds and 22 dry holes.

AFRICA is fast becoming a new source of oil for the world. Gabon, lying in the coastal embayments on the west side of the continent, appears to be a lucrative target. Fig. 2.

Currently, there are 11 rigs working in Gabon and the Congo area. SPAEF has four rigs busy doing exploratory drilling; two medium rigs are north of the Ogooue River, and two heavy rigs are near Rembo Kotto.

Seismic outlook . . . Rembo Kotto is the first step in making Gabon an important oil-producing section of Africa. Its position in the coastal embayments on the western side of the continent make it a very attractive hunting ground for oil. Last year alone there were 33 seismic party-months and 5 gravity party-months reported. Under the terms of the joint agreement, the Mobil companies are conducting seismic work on offshore areas of the SPAEF concession. The wide Continental Shelf around Africa may hold some important structures for future drilling. Mobil companies will do the offshore drilling if such structures are found off Gabon.

Geologic Sketch

With the ever-increasing search for oil in Africa, more and more is being learned about the huge continent's geology. The biggest part of Africa is covered with basement rock. Other large areas lack much oil hope since they were masked by post-Paleozoic lavas.

The northern part of Africa and the south end both contain highly folded and faulted geosynclinal belts; the Cape belt in the south, the Atlas belt in the north. The Cape belt is filled with Lower Paleozoic sediments of nonfavorable characteristics, while the Atlas belt is filled with Mesozoic and Cenozoic marine strata with numerous good sources of oil.

There are huge basins in the interior

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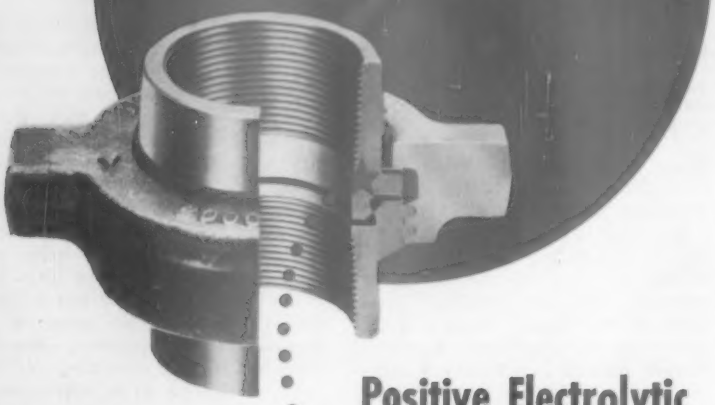

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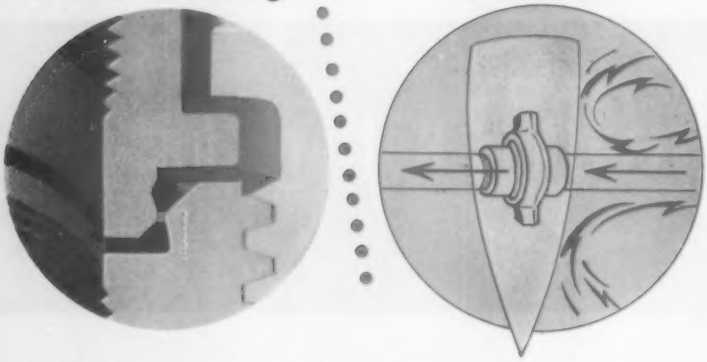

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TABLE 1—GABON OIL DATA—1958

Production:
3,761,000 bbl.; cumulative 5,042,-653 bbl.
Completions:
Field wells—32 oil, 1 gas, 26 dry
Wildcats—3 oil, 22 dry
Success ratios:
Field wells—56%
Wildcats—12%
Total footage drilled:
397,988 ft.
Active Rigs:
11 (November 1959).
Seismic party-months
33 seismic, 5 gravity.

TABLE 2—GABON'S OIL FIELDS

Pointe Clairette (dis. 1956)
—39 producers
—3,800 BOPD
—Upper Cretaceous (Senonian sand) pay
—producing depth 3,609 to 5,839 ft.
—32°-gravity crude
M'Bega (dis. 1957)
—19 producers
—3,340 BOPD
—Eocene silicified clays pay
—producing depth 2,510 to 3,757 ft.
—27°-gravity crude
Ozouri (dis. 1956)
—11 producers
—2,700 BOPD
—Eocene silicified clays pay
—producing depth 2,024 to 2,251 ft.
Cap Lopez (dis. 1958)
—4 producers
—Senonian pay
—producing depth 5,398 to 6,103 ft.
—70,300 bbl. oil output in 1958

of the continent filled with Lower Paleozoic, Carboniferous, Permian, Triassic, Jurassic, Cretaceous, and Quaternary rocks. This vast rock sequence fills the Congo, Angola-Rhodesia, Kalahari, and Karroo basins. The Paleozoic rocks of northern Africa are prolific producers of oil in Algeria and Libya.

The continent since Paleozoic time generally has stood well above sea level. But there are fringes and extensive embayments of marine sediments all around the continent. These coastal basins contain marine sediments representing encroachment of late Mesozoic and Cenozoic seas. In the late Cretaceous-early Tertiary time, this sea extended from Nigeria northward across Africa to the Mediterranean Sea. It is in these coastal embayments that Gabon's oil comes from. These Cretaceous-Tertiary sediments along the coastal embayments are and will be a prime target for exploration.

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Figs. 600-800-900

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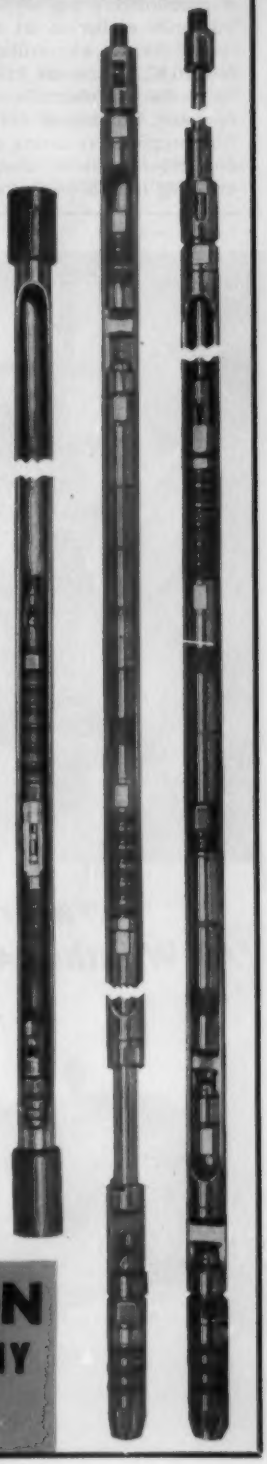

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MGM film lot test closely watched

THE MOST closely watched wildcat in California in some time was drilling ahead after unofficial reports had it encountering big shows and thick oil sands earlier in its drilling. The test, 1 MGM, was drilling ahead below 10,822 ft. on the 158-acre MGM movie lot in Culver City. Neither the operator, Continental Oil Co., or the film people, were saying anything, but competent outside observers were crediting it with being the state's biggest discovery this year.

The big zones reportedly were found in the Sentous sand. If true, the zone is probably an extension of the neighboring Inglewood field to the east. The Inglewood field's 18 Sentous wells have produced nearly 6.5 million barrels of oil. Some of the wells were in the 4,000-6,000-bbl.-daily class upon completion.

One scout reports was that the well almost blew out when drill pipe was being pulled and that it unloaded oil all over the derrick floor.

Continental said it expected to make an announcement when the test is completed in several weeks.

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Gosford extended in California

Production in Kern County's Gosford field was extended in a southeasterly direction by a well drilled in SE SE 23-30s-26e by Union Oil Co. of California. The well, 87X-23 KCL, was completed flowing 265 bbl. daily of 33.8°-gravity crude from an interval at 9,402-9,677 ft. The well offset production on the southeast edge of the field.

New unit slated for drilling in Alaska

A FOURTH UNIT is slated for drilling on Alaska's Kenai Peninsula.

Standard Oil Co. of California announced plans to drill a 12,000-ft. wildcat on the 70,720-acre Soldotna Unit which adjoins the productive Swanson River Unit on the south. The Standard test, a joint venture with Richfield Oil Corp., will be drilled in NW NW 4-7n-9w.

Thus far, two of three units drilled on the Kenai Peninsula have found pay. The Swanson River unit turned up a major oil discovery last year while the Kenai Unit was the scene of a recent gas discovery. The only unproductive unit on the peninsula thus far is the Deep Creek Unit 40 miles south of the Swanson, Kenai and Soldotna units. Standard drilled and abandoned a deep test at Deep Creek.

Hugoton adds dual gas completion

IN the northwest Anadarko basin, a Pan American Petroleum Corp. wildcat well in the southwestern Kansas sector of the Hugoton field has been dually completed for good gas recovery. The two productive zones count as deep gas discoveries.

Pan American 1 Kinsler C, located in Section 33-31s-40w, Morton County, was tested for a casculated openflow rate of 19.6 M.M.c.f.d. of gas. Recovery was from the St. Louis lime (Mississippian), at the rate of 15.5 M.M.c.f., and the Des Moines sand (Pennsylvanian) at the rate of 4.1 M.M.c.f.

The St. Louis was topped at 5,392 ft. and recovery was through perforations 5,464-66 ft. The Des Moines was topped at 4,250 ft.; perforations were not immediately available.

The 1 Kinsler C was drilled to a total depth of 5,926 ft., plugged back to 5,475 ft. The well is 3 miles north of the nearest Mississippian production at Richfield pool.

More fields open in Anadarko basin

OSWEGO Pennsylvanian oil production is being opened in northwestern Oklahoma's Putnam field in Dewey County. Sinclair Oil & Gas Co. 1 King, C SW NE 23-16n-17w, 1 mile southeast of the gas distillate discovery well of the field, flowed 341 bbl. of oil in 24 hours on ¾-in. choke from perforations at 9,664-99 ft., and 9,715-26 ft.

Nearest production is the field discovery well in 15-16n-17w.

Ellis County . . . Another field was opened in this northwestern county by Pan American Petroleum Corp.

The 1 Sherrill, C NW SE 36-21n-25w, east of Stattuck field, flowed 2 M.M.c.f.d., open flow. Perforations in the Morrow Pennsylvanian sand were at 9,853-56 and 9,863-66 ft. This is the fifteenth producing area in Ellis County to be opened in the past 2 years.

Michigan trend moves eastward

A THREE-QUARTER-MILE east extension of the Pulaski pool, Jackson County, was indicated with Davis Drilling Co. 1 Peterson, NW NE SE 17-4s-3w, drilling dolomite oil pay at 4,110-4,250 ft. Trenton logged at 3,726, elevation 1,031 ft.

This development was partly offset, however, with Perry Fulk 1 Rosenau, SE NW NW 6-4s-3w, logging Trenton at 3,851 ft. and missing dolomite pay to 4,511 ft. where well was shut down for orders. Test is located on trend, 1½ miles northwest of Pulaski pool.

● McClure Oil Co. will abandon 1 Tripp, NW SE SE 19-1n-13w, Trowbridge Township, Allegan County, a wildcat in the 20-year-old shallow Traverse oil field, after negative results on tests to a Salina A-1 zone gas show at 2,510-30 ft. After sand frac wildcat showed 2,000 ft. water in 12 hours with only a show of gas.

Deep Test Slated for East Texas Salt Dome

Location has been made for a 12,000-ft. (or to the Travis Peak formation) wildcat on the south flank of Bethel salt dome in northwestern Anderson County, East Texas.

Texaco Inc. 1 Walton Gas Unit 2 will be drilled 3½ miles south of Bethel townsite, in the Amon Lewellen Survey, A-480. Drill site is believed to be on the south edge of Bethel salt dome. It is 1 mile southeast of Woodbine production in Bethel field, and about 1 mile southeast of Rodessa production. Trant Drilling Co., Tyler, has contract for the test.

New Mexico field gets Devonian oil prospect

A deep wildcat in the Cross Roads field area of northern Lea County, New Mexico, has reported a heavy oil flow while testing the Devonian formation.

Pure Oil Co. 1-D Federal is 9 miles south of Milnesand, 3 miles southwest of the main Cross Roads field, and near an abandoned San Andreas discovery. Location is SE SE Section 31-9s-36e.

On initial test of the Devonian at 11,937-83 ft., open 3 hours, recovery was 2,700 ft. of 43° oil, plus 400 ft. of oil-cut mud, with no water. Oil flowed on test at 11,978-12,011 ft. After cleaning into pits for 2 minutes, it tanked 66 bbl. of oil in 40 minutes through ½-in. choke, then 61.6 bbl. in 1½ hours through ¼-in. choke. Flowing pressure ranged from 1,500-4,640 psi. Shut-in pressure was 4,730 psi.

Operators drilled ahead after the above test. Scheduled depth was 12,450 ft.

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Oil hunt spreads across Four Corners area

NEARLY 4 years have passed since the discovery of Desert Creek field in Utah's Paradox basin set off the impressive exploitation of the thick Pennsylvanian rocks. Development and exploratory drilling fanned in all directions in southeastern Utah's San Juan County. Late last year this Pennsylvanian push moved across the line into southwestern Colorado where prolific production was tapped at Towaoc and Flodine Park. But now the Pennsylvanian rocks in the Four Corners province may step aside while explorers evaluate the potential of two new sections—the Mississippian and the Dakota Cretaceous.

Paradox drilling will enter a new exploratory cycle as a result of the apparently major Mississippian gas discovery at Northwest Lisbon in San Juan County, Utah. Pure Oil Co. 1 Northwest Lisbon, NE NW 10-30s-24e, more than 50 miles north of Aneth field and 35 miles southeast of the only Mississippian production in Utah at Big Flat, flowed gas at the estimated daily rate of 8 to 10 M.M. c.f. on the fifth drill-stem test at 7,829-7,925 ft. Pure has tested almost 400 ft. of pay section with no water found as yet.

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Pure's discovery will have much bearing on planned and future Mississippian probing in the northern part of the basin. The Big Flat discovery stirred thoughts to this zone a couple of years ago, but subsequent drilling proved disappointing. Interest then fell flat until last summer when Texas Pacific Coal & Oil Co. gave Arizona its first Mississippian producer and the state's second oil well at 1 Navajo-138. This Apache County wildcat pumped 240 bbl. of oil per day from 5,649-69 ft. Its location on the southern edge of the basin plus the big success on the north side of the basin give the Mississippian a head start for a real wildcat going-over in the coming months. Pure also has a Mississippian prospect 16 miles southeast of Northwest Lisbon at its Southeast Lisbon wildcat in San Miguel County, Colorado.

San Juan basin drillers are looking to Dakota Cretaceous rocks as a major new source of oil and gas. After years of digging into other Cretaceous sands, such as the Gallup, Mesaverde, Pictured Cliffs, and Tocito, northwestern New Mexico now appears headed for a Dakota period.

The Dakota is the lowermost member of the Upper Cretaceous, lying deeper than the already-established gas and oil zones in the San Juan basin. A trend toward the Dakota as a drilling objective began over a year ago. Its success has been phenomenal. First success was in gas sands, but now the trend is switching to oil. During the past month two flowing oil wells were completed in Dakota inside Blanco gas field. Both were better than ordinary producers. Since the first of the year the basin has counted 26 oil and gas discoveries—15 of them producing from Dakota. Plans for near-term exploration in the basin call for even more Dakota drilling as reserves in this sand climb higher to establish the lower part of the Upper Cretaceous as a major San Juan producer.

Four Corners exploration will move to remote corners of the four basins in the area as this province enters its second round of wildcatting. Several important Pennsylvanian tests are working in southeastern Utah, a wildcat recovered oil and gas in the Pennsylvanian Hermosa in Montezuma County, promising another look at this area that has been quiet since Towaoc, and there will be an increase in Mississippian tests in both Arizona and Utah. If Pure's test in San Miguel County is successful, look for Mississippian drilling in Colorado.

An oil-barren basin, the Lucero, will get new drilling some 60 miles from any deep drilling. Southland Royalty Co. 1-14 Federal-Lucero, 14-

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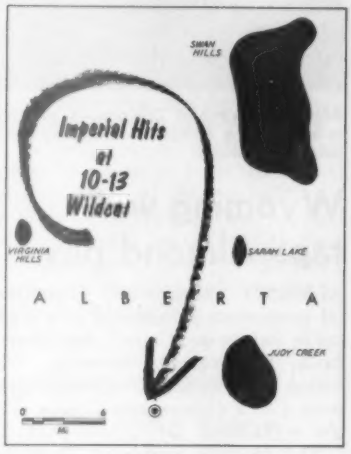
6n-11w, Valencia County, New Mexica, is one of four wildcats to ever go to the Pennsylvanian in the entire sparsely drilled basin. There has been some shallow drilling 12 miles northwest, but Lucero remains one of the least-tested wildcat frontiers in the Southwest. Interest is high in the basin's future, however, and projected drilling in the coming months may prove up another possible oil bowl.



ANOTHER Middle Devonian Beaverhill Lake oil discovery is reported in northwestern Alberta's Swan Hills region.

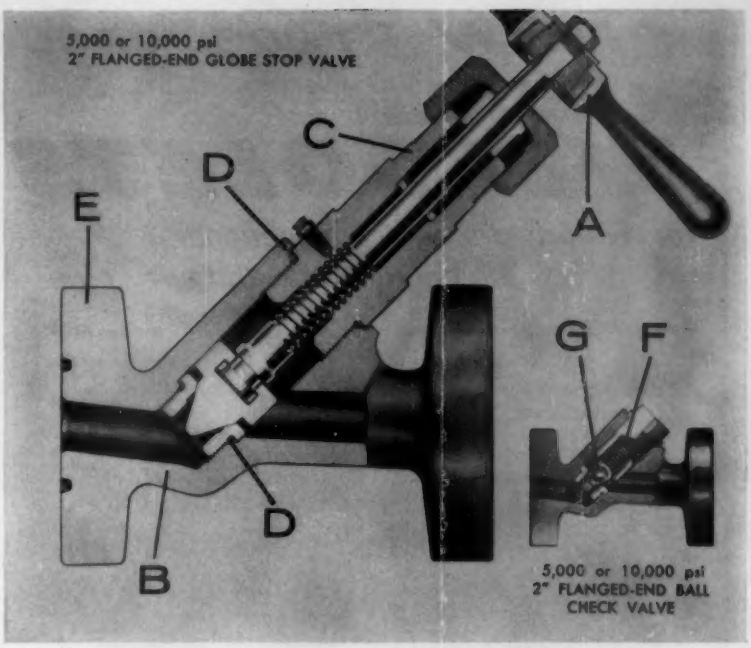
First winter find for Swan Hills

THE FIRST DISCOVERY of the winter season is reported in the Swan Hills region of northern Alberta. Imperial Oil 10-13 Virginia Hills, LSD 10, 13-63-12w5, has been completed as an oil producer in the Beaverhill Lake Middle Devonian with total depth at 9,185 ft. Imperial has not released any other data on the well, however.

Location of this new important addition to the vast oil potential of Swan Hills is southwest of Judy Creek field about 6 miles. It is 12 miles southeast of Shell Oil Co. of Canada's 6-34 Swan Hills discovery, and 8 miles north of North Whitecourt field, a Mobil Oil Co. discovery.

Tight well . . . Imperial has considerable acreage in the area and is believed keeping information on the well tight until after a coming lease sale next year.

Significant find . . . This new find is important due to its location southwest of Judy Creek, north of North Whitecourt, and southwest of Virginia Hills field. Judy Creek field itself is fast becoming a major discovery area.



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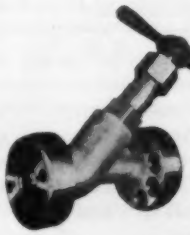
NEW GLOBE STOP VALVES—There are two new Edward flanged-end, globe stop valves: one for pressures to 5,000 lb WOG at 300F (10,000 psi test); and one for pressure to 10,000 lb WOG at 300F (15,000 psi test). Both valves have the exclusive cross-arm style Impactor handle* (A) that makes closing against high-pressure much easier, eliminates need for "cheaters." Valve body (B) is drop forged of chromium-molybdenum alloy steel to exacting requirements for maximum ruggedness and long-life under toughest service conditions. The inclined bonnet (C) facilitates streamlining of flow passages, reduces pressure drop and wear-producing turbulence. Metal gaskets (D) and buna-N "O" rings assure tight, leak-proof fit between body and bonnet and between seat and body. Flanges (E) are forged integral with body and faced according to A.P.I. Standard 6B.


New globe stop valve Figs. 5158 and 9158

New ball check valve Figs. 5160 and 9160

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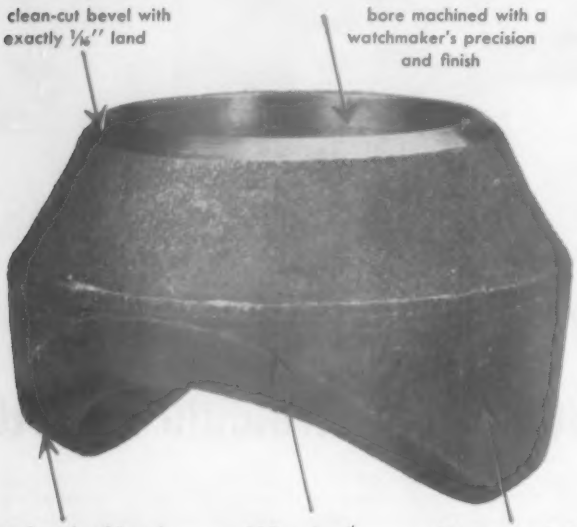
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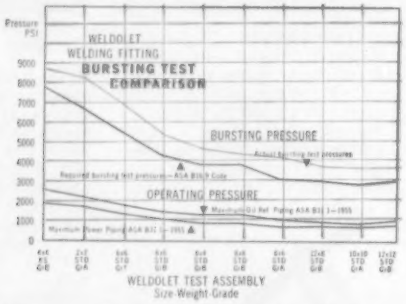

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ANOTHER Almond Cretaceous oil find is hinted at a Sweetwater County wildcat in Wyoming.

Wyoming well taps Almond pay

ALMOND (Mesaverde) Cretaceous oil production is indicated at a wildcat in Sweetwater County, Red Desert basin, southwestern Wyoming. The hinted strike is Texas National Petroleum Co. 1 Government-Chapin, SW SW 4-19n-99w.

The operator recovered 11 ft. of oil-saturated sand on a core at 3,698-3,717 ft. with coring continuing below 3,723 ft. This well is about 2 miles south of the Almond oil discovery at Texas National 1 Government-Withers in NE NE 32-20n-99w. That well is testing in four zones between 3,556 and 3,616 ft. It flowed 138 bbl. in 8 hours on ¼-in. choke on latest gage. The Chapin well is 7 miles northwest of El Paso Natural Gas Products Co.'s Patrick Draw Unit Almond oil discovery in SE SW 1-18n-99w. There is a southwest offset going at this well, drilling below 3,940 ft.

These recent Almond oil discoveries are creating considerable interest in Wyoming oil circles. The big news last year in the area was Almond and Lewis gas discoveries at Desert Springs and Arch. Now oil seems to be entering the gas scene. There has been no drilling at all in the area between Patrick Draw and the so-called West Desert Springs area. There is a 5 to 6-mile gap between Desert Springs, Arch, and Table Rock fields with no drilling. Last spring National Petroleum got an Almond gas discovery 3 miles north of the 1 Government-Withers and that area also is untouched by the drill.

The Green River basin (includes Red Desert) is on the brink of a heated campaign for gas and oil as a result of the big discoveries of the past few months. The scene has shifted into Red Desert basin again where we will likely see Almond

rocks get the big play in the coming months—with oil as the target.

New starts . . . Offset wells were announced last week by Union Pacific Railroad Co. to the northwest and southeast of the important Almond Mesaverde Cretaceous oil discovery at Texas National Petroleum Corp.'s 1 Government-Withers in NW NW 32-20n-99w, Sweetwater County, Wyoming.

The new Green River basin trys are 34-29 UP in SW SE 29-20n-99w and the 12-33 UP in SW NW 33-20n-99w. Both will test to Erickson. This is the railroad's first drilling under its own name. The company picked one of the most active basins in the Rockies in which to begin their exploratory work. At the present time the West Desert Springs area is the center of wildcat interest due to the tremendous potential of the Almond as first a gas producer and now more lately as an oil reservoir.

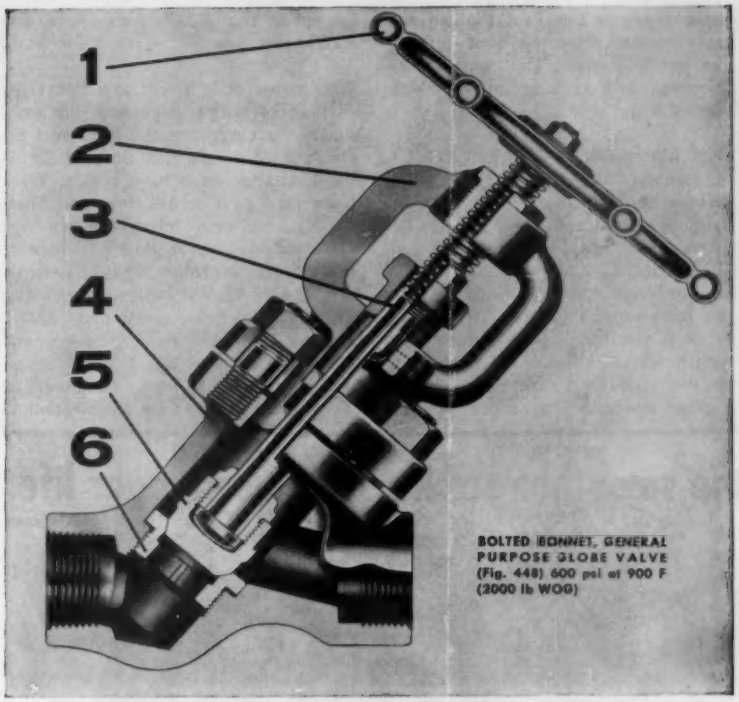
Big land deals spark Arctic hunt

THE YEAR 1960 will be one of importance for the vast, frozen wasteland north of the 60th Latitude . . . the Yukon and Northwest Territories. Many large scale deals are in the mill—these added to those that engulfed the region last year total some of the most interesting developments in northern Canada yet.

One large deal, not yet officially reported, involves the acquisition of nearly 3½ million acres by two majors. This two majors are from a group already planning to drill on the lands itself by December 1. The deal should be near the million-dollar mark.

Atlantic Refining Co., second-largest landholder in the Northwest Territories, is doing seismic work on a portion of its lands. Rumor has it that the firm might drill later this winter. Canadian Husky Oil Ltd., has recently completed seismic studies on one of its wholly owned tracts and has staked location. That tract is in the Norman Wells region. An early start is expected here.

Imperial active . . . It is rumored that Imperial Oil Ltd. will be the most active explorer with plans for 12-15 tests. D. Todd Briggs, pioneer wildcatter in the Territories, plans to put down at least six tests. The Ameranda-Ohio team has staked location for a wildcat, but no details are available. More activity is also expected by the Western Minerals group that found



BOLTED BONNET, GENERAL PURPOSE GLOBE VALVE (Fig. 448) 600 psi at 900 F (2000 lb WOG)

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oil and gas in the Peel Plateau this past summer, opening first production in the Yukon. That well will be deepened and at least another location is in the wind.

Shell hits granite . . . Shell Oil Co. of Canada, Ltd., the largest single acreage holder in the region, is sitting tight. Shell's recent Liard River wildcat test, planned as a 12,500-ft. test, hit granite at 2,300 ft., causing the present wait and see attitude. Shell still has great faith in this virgin wildcatter's territory, having just last month added 700,000 more acres to its vast holdings along the Alaska-Yukon border. The company now has over 16,000,000 acres in the Territories.

Rigs down . . . There are eight rigs in the Territories at present, but only one is working. Imperial has two rigs, Western Minerals and Bawden Drilling Co., Ltd., each have a pair, Wardean Drilling Co. has one, and Shell Oil Co. has one. Imperial's two rigs are stacked—one at Fort Providence, the other at Norman Wells. Bawden's rig is stacked, but will work for the unknown major mentioned above and for Imperial. One of the Western Mineral rigs is at the 1 Chance discovery in the Yukon, the other at Dawson. Wardean's rig is also stacked at Fort Providence, while Shell's is down at Liard River.

Frio find reported in Texas' Chambers

A wildcat located slightly less than a mile southeast of South Cotton Lake field, in the Texas Coast's Chambers County has been completed as a gas-condensate discovery well.

It is J. P. Petkas' 1 Casey-Barrow Unit, rated good for 56 M.M.c.f.d. with liquid yield of 23.3 bbl. of 58.5° condensate per 1 M.M.c.f.

Production is from a 3-ft. interval in Frio sand at 7,659-62 ft. Oil and gas production in South Cotton Lake field is from a 6,500-ft. horizon.

Petkas is drilling near the new pay zone in his second test 1,100 ft. southwest of his discovery well.

The area is 5 miles southeast of Mount Belview in the old Barbers Hill salt-dome field.

Andrau sand pays in Galveston area

A new discovery well drilled by Sun Oil Co. is 1¾ miles southeast of Sarah White field, in southern Galveston County, Texas, is rated good for 124 M.M.c.f.d. of gas, with condensate recovery of 1 barrel per 9,870 cu. ft.

Production is from the 13,600-ft. Andrau sand, perforated at 13,622-32 ft. Production in the original Sarah White field, opened last year, is from a 9,200-ft. Frio sand.

Sun's well, 1 Wangemann, was drilled to 15,016 ft. Pipe is cemented at 14,412 ft.

Gravity of the condensate is 44.1°. Top pressure of the well is 11,912 psi., shutin.

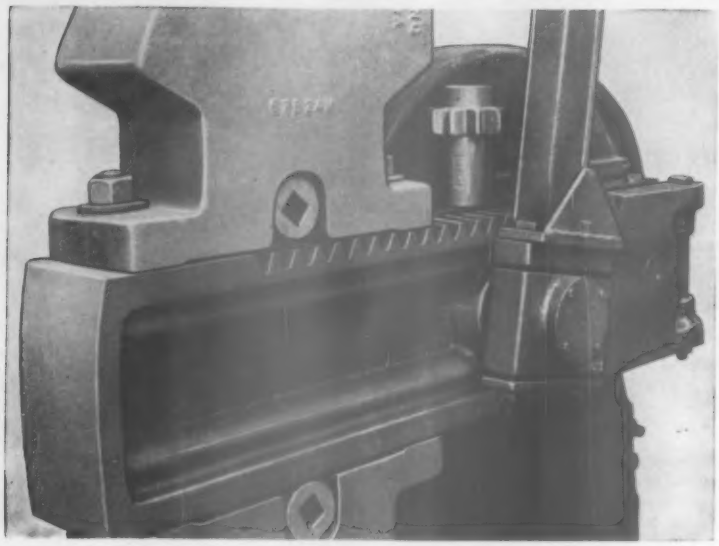
Texas Cotton Valley gets confirmation

East Linden field in southern Cass County, East Texas, in June became Texas' first oil field from the Cotton Valley formation. Last week a long southwest offset to the discovery was completed as a confirmation well.

Second well in the field is Pan American Petroleum Corp. 1 East Texas Iron Co. Operators drilled into the basal Cotton Valley limestone at 10,657 ft. on elevation of 374 ft., and made completion at 10,658-92 ft. Initial potential, pumping, was at the rate of 66 bbl. of 48° oil a day, with no water. Gas-oil ratio was 617:1.

East Linden field is 4½ miles southeast of the town of Linden. No. 1 East

the smoother stroke . . . gives longer life



. . . with this JENSEN Rotary Balanced Jack!

The easy to adjust rack-and-pinion system of JENSEN's Rotary Balanced Jack provides a smoother stroke throughout the entire pumping cycle . . . thus assuring longer, trouble-free service from the sub-surface equipment as well as the pumping unit. Uses less electric power too!

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JENSEN JACKS

Texas Iron Co. is in the George S. Young Survey, Abstract 1161.

Pan American Petroleum opened Cotton Valley oil production in the field at its 1 Giraud. The well attracted interest not only as the state's first Cotton Valley oil production, but as a triple completion. Completion potentials and pay zones were: 281 bbl. per day at 10,620-63 ft.; 45 bbl. per day at 10,254-83 ft.; and 129 bbl. per day at 9,864-9,958 ft.

Big gasser stirs Ohio's Ashtabula

CONSIDERABLE interest is being centered on a rank wildcat by Smith-Mouser on 1 John Roach, Lot 31, in northwestern Hartsgrove Township, Ashtabula County. The well, scheduled as a Clinton sand test, struck 10 M.M.c.f.d. of gas in the Oriskany sand between 2,300-24 ft. The Oriskany gas was flared after mudding off failed and drilling was continued to test the Clinton which was found to be dry. The hole is being plugged back to complete in the Oriskany.

Location is on a farmout from Magnolia Oil Co., Crusade Oil Co. and Phillips Petroleum Co. to N. T. Smith and Keith Mouser and is about 8 miles from nearest production.

A ½-mile stepout, 1 W. Macko, Section 31, in southwestern Wooster Township, Wayne County, flowed 100 bbl. oil with 157 M.c.f.d. of gas in a 24-hour test after fracture.

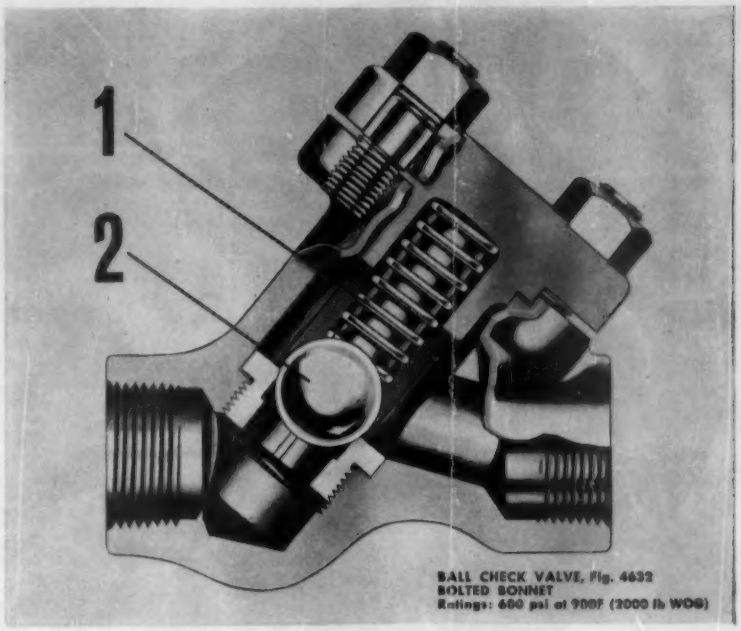
The operators, W. & J. Macko reported the natural production from the Clinton sand at 3,162-72 ft. was 5 bbl. oil and a showing of gas.

North Wind River wildcat flows gas

NORTH LYSITE AREA in Fremont County, Wind River basin, Wyoming, has a 21 M.M.c.f.d. gas discovery. It is Gulf Oil Corp.'s 1 Lysite-Federal, SW NE 23-39n-91w.

Gulf tested the big flow as absolute open gage. Perforations are at 6,780-86 ft., 6,796-6,809 ft., and 6,815-27 ft. in the Upper Cretaceous. Top of Fort Union Tertiary is 4,409 ft., Lance Upper Cretaceous at 5,002 ft. Location of this important strike is about 4 miles northeast of West Lysite oil and gas field. There has been only one well drilled in the area between West and North Lysite.

Other news . . . In other Wyoming areas, Champlin Oil & Refining Co. completed its Minnelusa Pennsylvanian oil discovery north of Donkey Creek field in Crook County. This



BALL CHECK VALVE, Fig. 4632
BOLTED BONNET
Ratings: 600 psi at 900F (2000 lb WOG)

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Edward Check Valves for petroleum services

For the many petroleum services from oilfield to refinery where protection against flow reversal is required, Edward furnishes a complete line of forged steel check valves for horizontal or vertical installation.

EDWARD BALL CHECK VALVES are specially designed to provide rugged, shock-free service where liquid or heavy viscous fluids are piped. The stainless steel spring (1 above) is sized and rated to give positive seating with heaviest of fluids. And the ball disk (2), made of EValloy 16% chromium stainless steel for tight seating, can be easily replaced when needed.

EDWARD PISTON CHECK VALVES also give freedom from shock or vibration, plus streamlined body design for full flow area and low pressure drop. Exclusive disk guide and spring loading allow for quick, positive seating.

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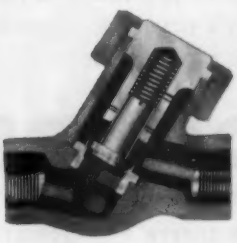
- your choice of screwed, socket welding or flanged ends
- rugged bodies of specially heat treated forged steel
- strong spring of stainless steel for sure closing action
- corrosion-proof stainless steel seats, and stainless steel piston disks or ball disks
- union, screwed, or bolted bonnet available

Edward builds a complete line of cast and forged steel valves for pressures to 10,000 lbs, with flanged, screwed, socket or butt welding ends. For additional information, see your favorite distributor, or write Edward Valves, Inc., 1212 West 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company.


PISTON CHECK VALVE, Fig. 3578
UNION BONNET
Ratings: 1500 psi at 850F
(3600 lb WOG)

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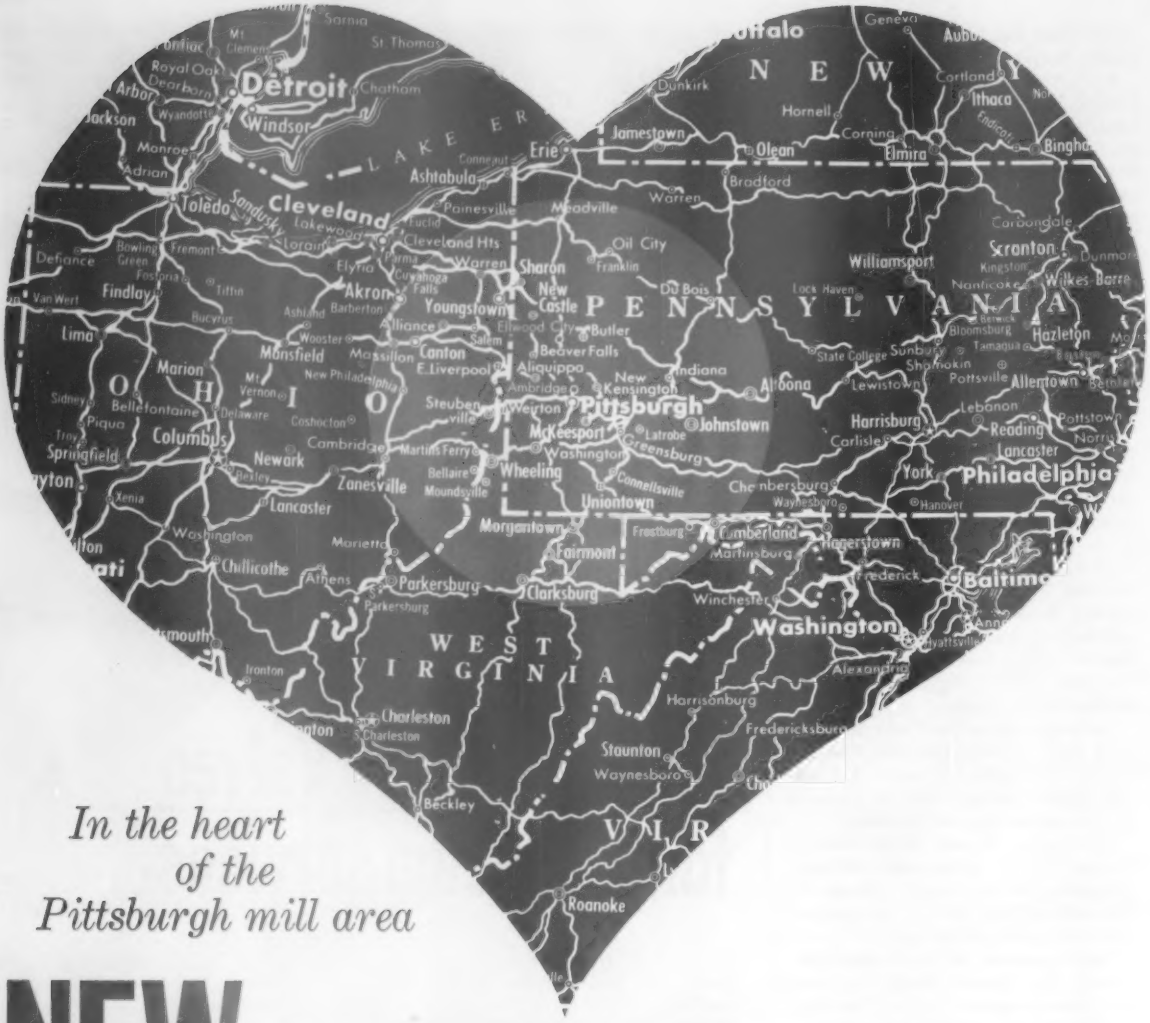
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Indiana
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Oil City
Franklin
Du B

Powder River basin strike pumped 500 bbl. per day on completion.

Pure Oil Co. reports gas shows at its 16,500-ft. wildcat at Badwater Unit in Wind River basin, the deepest producing area in the Rockies. The shows were at a mark below 12,000 ft.

Oil flow at multipay Nueces Texas well

Initial tests have proved good oil flows in at least one of the three potentially productive zones logged in a wildcat drilled by Barney Fisher and Lloyd Davidson 5 miles south of Robstown, in Nueces County, on Texas' lower Gulf Coast.

Flow from this zone, perforated at 7,651-57 ft., was gaged at 160 to 180 bbl. per day through ⅛-in. choke. Gas-oil ratio was 600 cu. ft per bbl., and flowing pressure 700 psi.

Testing now is under way in a slightly deeper sand, at 7,700 ft. Dual completion in this sand is planned. The third zone, at 7,800 ft., will be tested later. Total depth is 8,513 ft.

The well, 1 Schulze, is about 3 miles from nearest production, this being in the expansive Minnie Bock field on the west.

West Texas wildcat has oil on DST

A deep wildcat in northwestern Gaines County, West Texas, has found good oil shows while drill-stem testing in Devonian rocks.

Texaco Inc. 1 M. S. Jones, NCT-1, at last report had total depth at 11,090 ft. in limestone, and was running a test over the interval from 11,067-90 ft. Oil recovery was on a 2-hour test at 10,970-11,065 ft. Recovery in the pipe was 1,000 ft. of clean, 42.6° oil, with no water reported.

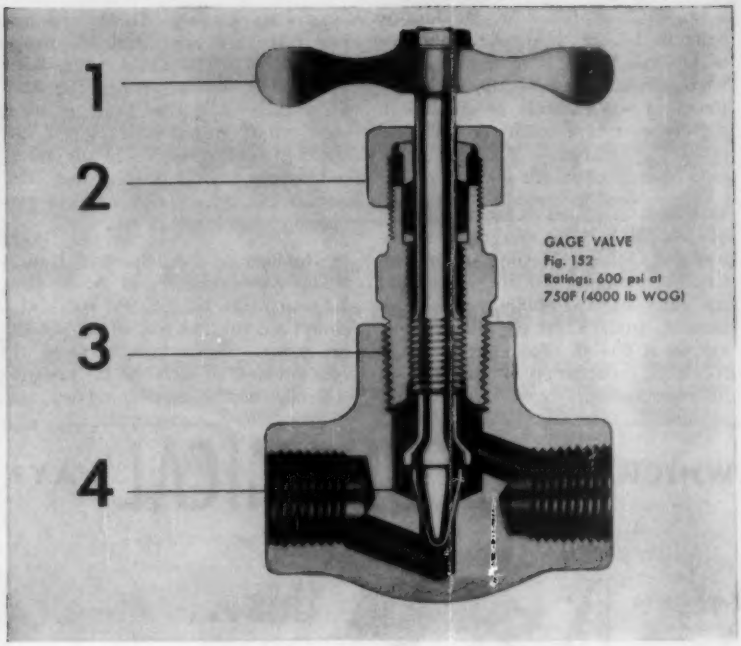
Location of the new discovery prospect is NE NE Section 12, Block A-7, PSL Survey. It is 24 miles northwest of Seminole, and 2 miles southwest of nearest Devonian production in South Jones Ranch field.

All three states hit in Illinois basin race

Exploratory events in the Illinois basin are centered in Webster County, western Kentucky, Brown and Clay counties, Illinois, and Spencer County, Indiana.

In Kentucky . . . Illey B. Browning & Sons and King-Stevenson have casing set at Hardinsburg, Cypress, and Paint Creek prospect in Webster County.

Operators will test the Hardinsburg at 2,531-46 ft., the Cypress at 2,787-2,828 ft., and the Paint Creek at



GAGE VALVE
Fig. 152
Ratings: 600 psi at 750F (4000 lb WOG)

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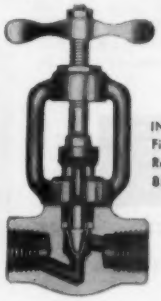
Edward instrument valves have a carbon or 13% chromium stainless steel body. Carbon steel body has an integral cobalt-chromium-tungsten alloy steel seat that resists pitting and gives maximum resistance to corrosion and erosion. You have a choice of screwed or socket welding ends.


INSTRUMENT VALVE
Fig. 952
Ratings: 2500 psi at 850F (6000 lb WOG)

MANY FEATURES:

1. **Contoured T-handle on both gage and instrument valves provides easy, finger-tip control.**
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3. **Taper-threaded joint between bonnet and body of gage valves prevents bonnet from backing out of valve. Instrument valves are of bonnetless design.**
4. **Semi-needle, integral stem-disk is made of EValloy 13% chromium or 18-8 alloy stainless steel, hardened for wear resistance on both gage and instrument valves.**

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another fine product by
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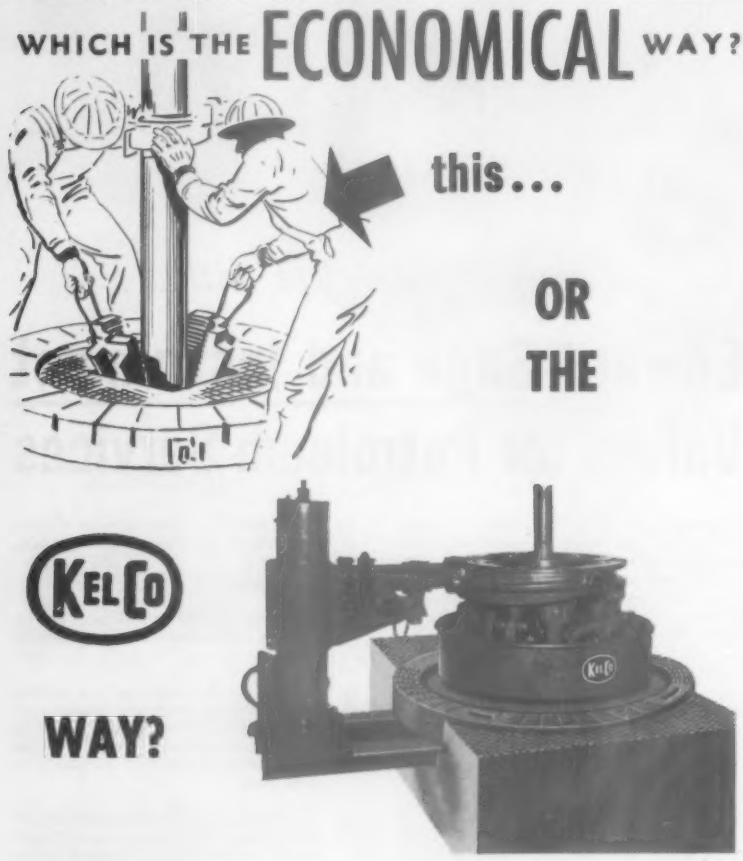
2,832-46 ft. at the 1 W. W. McCoy heirs in 1-L-22, 1½ miles southeast of Dixon. A drill-stem test at 2,560-95 ft. flowed clean oil in 80 minutes. Recovery was 1,200 ft. of oil, 180 ft. slightly oil-mixed mud. A drill-stem test at 2,793-2,842 ft. got 1,380 ft. of gas, 75 ft. mud-mixed oil.

In Illinois . . . Charles Eager 1 Davis, SE SW SE 8-2s-4w, 6½ miles southwest of Mount Sterling in Brown County, pumped 576 bbl. of oil and no water on a 24-hour pump gage, natural, from 8 in. of Silurian pay topped at 634 ft. Total depth is 634 ft. This producer is in an area of little production.

. . . Clay County. There is a new pay discovery near Bible Grove at Mutual Oil & Gas Co.'s 1 Vita Richard in the NWc 17-5n-7e. The Rosiclare lime at 2,818-25 ft. is being swab-tested. A drill-stem test at 2,790-2,825 ft. got 1,505 ft. of oil, 60 ft. muddy oil, and 60 ft. salt water. This is a 1-mile stepout to existing production.

In Indiana . . . A Spencer County wildcat, Otis Greer and A. B. Doty 1 Curtis Mills, NE SE NW 6-6s-4w, is completed for 118 bbl. of oil per day on pump. Production is from the Jackson sand at 677-700 ft. Location is 6 miles northeast of Grandview, Ind.



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Second well in Texas pool is completed

Flush oil production for the new Bayex field in southwestern Jack County, North Texas, has been reported at the field's second well.

Bayview Oil Corp. and Exploration Surveys, Inc., Dallas, have completed their 1-A H. C. Gilmore for 396 bbl. of oil a day. The potential was based on a 6-hour flow of 99 bbl. of 41° oil through 10/64-in. choke. Tubing pressure was 800 psi.; gas-oil ratio was 890:1. Top of pay was picked at 4,598 ft.

Location is 15 miles southwest of Jacksboro in the George Dedrick Survey, A-176. It is an offset to the same operators' 1 Gilmore, Mississippian discovery for Bayex field.

Texas well taps Frio gas pay

Shallow Frio sands have added another good gas discovery on the developing trend through Goliad, DeWitt, and Victoria counties of Texas' central coastal region.

It is in the Wilhelm area, north of Goliad, in central Goliad County. Discovery is by Welsh Oil & Gas Co. at its 1 Hall, completed with a calculated open-flow potential of 152 M.M. c.f.d. The gas is dry.

Production is from a 2,950-ft. zone with perforations at 2,948-52 ft. Total depth is 3,150 ft.

Potential is calculated from actual flow rates ranging from 1,600 M.c.f. per day through ¼-in. choke to 726 M.c.f.d. through 10/64-in. choke. Pressures were 1,262 psi. through the 10/64-in. opening, and 1,259.5 psi. through the ¼-in., a pulldown of only 2½ psi. Shut-in pressure is 1,264 psi.

Louisiana gets gas-condensate strike

Gas-condensate production of the already widespread LaRose area, southwest of Lake Salvador, in Lafourche Parish, coastal Louisiana, is being extended another 1½ miles north.

There, Union Producing Co.'s extension wildcat, 1 M. R. Fee 852, in 38-16s-21e, flowed at the rate of 3 M.M.c.f.d. of gas while testing perforations at 12,429-31 ft. Flow was under pressure of 3,624 psi.

LaRose field, discovered in 1958, until recently has been one of coastal Louisiana's more active areas. More than 25 wells have been completed in the area with production from a multiplicity of sands from 10,900 ft. to 12,500 ft.

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THE NEW LAND AND SEA MUD TESTING LAB

Milwhite Mud Sales Company has developed for the drilling industry a new portable mud testing lab. The Porta-Lab was designed to be both flexible and compact. It can be carried onto offshore barges or into sheltered buildings or simply worked from the trunk of an automobile.

The complete Porta-Lab comprises two separate units which resemble medium-size suitcases. They are generally installed in the trunk of the automobile on specially designed mounting brackets and are attached to the brackets by two wing nuts. The Porta-Lab can be easily removed from the trunk by loosening the wing nuts.

Each Porta-Lab unit measures 16-13/16 inches wide, 12-3/16 inches high, and 7-1/2 inches deep. They are fabricated from 18 gauge stainless steel. Fully equipped, one unit weighs 38-1/2 pounds and the other 28-1/2 pounds.

The Porta-Lab was designed to provide for two distinct phases of the mud engineer's work. One unit is used to measure all the mud properties with the exception of the funnel viscosity, mud weight, and oil content. The second unit is used to make all mud pilot tests and retort analyses.

The Porta-Lab is made to provide its own work table. When open, the top lid is hinged into a vertical position. The front side or panel is hinged to drop forward into a horizontal position to make a suitable work table.

Features incorporated in the field test lab include the mounting of the filter press on the exterior right side to allow the use of a 10 or 25 ml graduated cylinder to keep possible filtrate spillage from the other equipment. Plastic is substituted for glass wherever possible to keep breakage cost at a minimum. The positioning of the viscosimeter, filter press, and other equipment provide excellent handling balance.

In the pilot test lab, a built-in retort eliminates the need for a separate carrying case for this unit. The retort receives its heat from an LP bomb which gives approximately 10 to 15 retort analyses. Distillation time is normally faster than for the conventional electric heating elements. Another plus feature of the Porta-Lab is that rig voltage is not relied upon for the analysis. Room is also available for an optional power converter to give 12 volts AC from 110 volts AC to power the V-G Meter and mixer motor.

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Buying too much gauge for your purpose? Save with volume-priced, precision-built USG Drawn Case Gauges for service where your gauge need calls for A.S.A. Grade B standards, including 2% accuracy. *Write for Catalog 64A.*

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Discovery wells

COLORADO

Logan County: Ambassador Oil Co. 1 Norcott, C SW NW 26-11n-55w. IPP 40 BOPD, 100 BWPD, "J" sand discovery, new field. TD 5,518 ft. "J" sand.

ILLINOIS

Adams County: Ray F. Starr 1 Wendell Doole "A," NE¼ 11-2s-5w. IP 3 BOPD, 37.4°, Silurian 639-48 ft. TD 675 ft. Opens Kellerville pool.

Clay County: VS&S Drilling Co. 1 Ralph Van Dyke, SE SE SE 3-5n-6e. IP 101 BOPD, 2 BWPD, Aux Vases 2,702-08 ft. TD 2,713 ft. Extension to Hord pool.

Marion County: Beeson Oil Co. 1 Malan, SW NE SE 19-4n-1e. IP 60 BOPD, Benoist 1,440-45 ft. TD 1,445 ft. Extension to Patoka pool.

White County: Inland Producers Co. 1 Ruth Simmons, NW NW SW 25-5s-8e. IP 120 BOPD, 85 BWPD, Benoist 2,955-72 ft., O'Hara 3,146-61 ft., Rosiclare 3,189-95 ft. TD 3,250 ft. New pays.

INDIANA

Daviess County: Sterling Drilling Corp. 1 James Thompson, SE SE NW 32-5n-5w. IP 15 BOPD, Salem 904-13 ft. TD 938 ft. Opens South Odon field.

Dubois County: Art Fritz 5 Lawrence Mehne, NE NW NW 16-3s-5w. IP 5 BOPD, 38 BWPD, Benoist 823-842 ft. TD 966 ft.

Gibson County: N. B. Smith 1 R. Besing, NW NE SW 25-3s-10w. IP 3 BOPD, 30 BWPD, Hardinsburg 1,438-48 ft. TD 2,013 ft. Extension to Wheatonville Consolidated field.

1 P. Nordhorn, NE NW SW 25-3s-10w. IP 35 BOPD, 10 BWPD, Hardinsburg 1,433-40 ft. TD 1,442 ft. Extension to Wheatonville.

L. Berry 1 Kramer, NE SE SE 26-3s-10w. IP 23 BOPD, Aux Vases 1,971-81 ft. TD 1,988 ft. Extension to Wheatonville Consolidated pool.

The Elbo Co. 1 Wheaton, NW NW SE 15-3s-9w. IP 86 BOPD, 76 BWPD, upper Hardinsburg 1,281-87 ft. TD 1,860 ft. Extension to West Summerville field.

Elbo Co. 2 W. Heaton, SW NW SE 15-3s-9w. IP 58 BOPD, 30 BWPD, Lower Hardinsburg 1,303-09 ft. TD 1,513 ft., New pay.

Knox County: D. L. Dieterle 1 L&E Kramer, SW 25-2n-11w. IP 30 BOPD, 2 BWPD, Aux Vases 1,804-1,814 ft. TD 1,818 ft. Extension to St. Thomas pool.

Perry County: G. M. Pounds 1 Fred Lehmkuhler, NW NW SW 36-4s-3w. IP 3 BOPD, Jackson 405-14 ft. TD 448 ft. Extension to Bristow.

Toliver Oil Co. 4 James Kelly, SE NE 25-3s-2w. IP 2 BOPD, 1 BWPD, Hardinsburg 275-200 ft. TD 362 ft. Opens St. Croix pool.

Spencer County: Stanley Lambert 4-B Winkler, SE NW SW 28-6s-5w. IP 76 BOPD, Jackson 898-912 ft., 916-20 ft. Paint Creek 1,007-16 ft., 1,022-26 ft. TD 1,235 ft. New pay discovery.

Warrick County: D. Moroney 1 Tennyson, SW NW NE 22-5s-7w. IP 28 BOPD, 2 BWPD, Cypress 1,231-46 ft. TD 1,558 ft. Opens Degonia Springs pool.

KANSAS

Barber County: Lario Oil & Gas Co. 1 Axline, NE NW NE 17-31s-11w. IP 10 M.M.c.f.d., Douglas sand 3,776-70 ft. TD 4,875 ft. Opens Southwest Ills field.

Barton County: Thomas H. Allen 1 Christen, SW NE SE 10-16s-12w. IP 52 BOPD, 44°, Lansing-Kansas City 3,232-38 ft. TD 3,341 ft. Beaver extension.

Butler County: H&M Drilling Co. 1 Bennett, NE NW SW 14-29s-7e. IP 25 BOPD, 150 BWPD, 37°, Miss. 2,804-18 ft. TD 2,850 ft. Opens Latham field.

Clark County: John Booth et al. 1 Mary L. McMinimy, C NE SW 13-33s-22w. IP 6,520 M.c.f.d., Morrow 5,266-72 ft. TD 5,349 ft. New field.

Davis Bros. 1 Ross "D," SE NW SW 7-10s-17w. IP 35 BOPD, 15% bw., 34°, Lansing-Kansas City 3,494-3,518 ft. TD 3,715 ft. Mt. Ayr extension and revival.

Cowley County: Saffa-Braver and Crisswell 1 Lauppe, NW SW NW 6-32s-6e. IP 10 BOPD, 30 BWPD, Burgess sand 3,081-89 ft. TD 3,089 ft. New field.

Edwards County: Cities Service 1 English, SW SW NW 31-25s-16w. IP 171 BOPD, 35.2°, Miss. 4,477-84 ft. TD 4,660 ft. Opens English field.

Ellis County: Davis Bros. and Transit Corp. 1 Chrisler "H," W½ NW SE 36-11s-16w. IP 15 BOPD, 5 BWPD, 30°, Lansing-Kansas City 3,099-3,248 ft. TD 3,462 ft. Northeast Blue Hill field discovery.

Shields Producing Co. 1 Madden, NW NW SE 21-12s-18w. IP 39 BOPD, 39 BWPD, 32°, Lansing-Kansas City 3,437-44 ft. TD 3,712 ft. Opens West Koblitz field.

Graham County: Burch Drilling Co. 1 Goddard, SE SE NW 23-9s-23w. IP 57 BOPD, 34°, Lansing-Kansas City 3,772-74 ft. TD 3,940 ft. Opens North Vesper field.

Empire et al. 1 Schreiner "C," NE NE NW 23-10s-25w. IP 265 BOPD, 41.4°, Lansing-Kansas City 3,922-28 ft. TD 4,192 ft. Discovery of Southeast Elrick field.

Grant County: Northern Natural Gas Co. 1-7 Anderson, C SW NE 7-27s-37w. IP 14,670 M.c.f.d., Council Grove 2,716-22 ft. TD 5,585 ft. Opens new field.

Hugoton Production Co. 2 Dunne, C SE 13-30s-37w. IP 6,940 M.c.f.d., Council Grove 2,800-14 ft., 2,843-47 ft., 2,850-54 ft., 2,866-74 ft., 2,890-94 ft. TD 6,063 ft. New field in Panoma area.

United Producing Co. 1 C. L. Hickman, 23-30s-35w. IP 76 BOPD, 2 BWPD, 41°, Chester 5,466-80 ft. TD 5,836 ft. Opens Hickman field.

Greenwood County: Holly Oil Co. 1 Spencer, SW NE SW 23-23s-9e. IP 21 BOPD, 32°, Miss. 2,403-14 ft. TD 2,414 ft. Opens Spencer field.

Harper County: Pickrell Drilling Co. 1 Brown "B," SW SW NW 5-32s-9w. IP 15 BOPD, 30% bw., 4 M.M.c.f.d., Miss. 4,339-65 ft. TD 4,438 ft.

Haskell County: Helmerich & Payne 1 Eubank "A," C NW SW 33-28s-34w. IP 174 BOPD, 38.5°, Chester 5,402-12 ft., 5,420-28 ft., 5,452-60 ft., TD 5,680 ft. New field.

W. J. Coppinger 1 Reimer, C NE SW 35-28s-34w. IP 121 BOPD, 39°, Lansing 4,168-74 ft. TD 5,630 ft. Opens Southwest Eubank field.

Marion County: Crowe Drilling Co. 1 Cooper, SE SE SE 13-22s-3e. IP 30 BOPD, 39°, Mississippian 2,510-15 ft. TD 2,550 ft. Opens South Shanks field.

Meade County: Texaco Inc. et al. 1 H. G. Adams "B," C NW NW 26-34s-29w. IP 42,231 M.c.f.d., Council Grove 3,228-44 ft.; Toronto 4,390-4,402 ft. TD 6,400 ft. New field.

Thomas & Brewer 1 D. K. Baty, C SE SE 17-32s-30w. IP 77 BOPD, 38°, Morrow 5,602-94 ft.; Chester 5,702-07 ft. TD 5,750 ft. New field.

Morton County: Hamilton Brothers 1-22 Mingenback, C SE NW 22-34s-40w. IP 1,145 M.c.f.d., Lansing 4,249-59 ft. TD 6,148 ft. New field.

Phillips County: Rine Drilling Co. 1 Lynch "A," C SE NW 25-4s-20w. IP 30 BOPD, 40°, Kansas City-Lansing 3,142-46 ft. TD 3,480 ft.

R. W. Shields and Cook & Galloway Drilling Co. 1 States, SW NW NE 18-5s-20w. IP 177 BOPD, 33°, 3,249-58 ft. TD 3,555 ft. Stony Point field discovery.

Rawlins County: Skelly Oil Co. 1 Wilhelm Meyer, SE SE NW 20-1s-23w. IP 258 BOPD, 35°, Lansing-Kansas City 4,061-70 ft. Opens Wilhelm field.

Reno County: Messman-Rinehart 1 Epperson, C W½ SW SE 33-23s-5w. IP 51 BOPD, 20°, Hunton 3,728-32 ft. TD 3,856 ft. Opens South Stroud field.

Rooks County: Davis Bros. et al. 1 Yohoe "C," NW NE SW SE 24-10s-18w. IP 30 BOPD, 60% bs., 34°, Lansing-Kansas City 3,492-3,518 ft.; Marmaton 3,534-37 ft. TD 3,675 ft. Extension to South Finnesy field.

Russell County: Womer Oil Co. 1 Hagerman, NE SW SE 28-11s-15w. IP 36 BOPD, 34°, Arbuckle 3,273-79 ft. TD 3,325 ft. Opens Hagerman field.

Stafford County: Sierra and Houston Petroleum Co. 1 Waters-Grossman, NW NW NE 1-25s-15w. IP 11 BOPW, Arbuckle 4,415-21 ft. TD 4,421 ft.

Stevens County: Hugoton Production Co. 2 Larrabee, C SE 23-31s-39w. IP 6,260 M.c.f.d., Council Grove 2,691-2,906 ft. TD 5,990 ft. New field.

Shell Oil Co. 1-35 Walkemeyer, C NE SW 35-33s-36w. IP 4,090 M.c.f.d., Morrow 6,145-65 ft., 6,172-80 ft. TD 6,510 ft. Opens Walkemeyer field.

Sumner County: Dorset Co. 1 Walta, SE SE NE 25-33s-4w. IP 29 BOPD, Simpson 4,507-12 ft. TD 4,512 ft. Opens Walta field.

Trego County: Franco-Central 1 Egger, C S½ NE NE 14-13s-21w. IP 660 BOPD, 39°, Marmaton 3,808-26 ft. TD 3,900 ft. New pay and extension to Egger field.

KENTUCKY

Daviess County: Hupp Oil Co. 1 T. P. Miller, 1-N-29. IP 19 BOPD, 13 BWPD, Tar Springs 1,127-45 ft. TD 1,147 ft. Extension to Glenville pool.

Hupp Oil Co. 3 Powell, 1-N-29. IP 4 BOPD, Tar Springs sand 1,131-41 ft. TD 1,141 ft. Opens Sutherland pool.

Grayson County: Combs & Bobo 1 G. Stinson, 1-L-37. IP 5 BOPD, Warsaw 544-548½ ft. TD 672 ft. Opens Hopewell Church field.

Green County: W. K. Howard 1 R. A. Thompson, 7-H-47. IP 14 BOPD, Blue sand 554-60 ft. TD 560 ft. Extension to Happy Valley field.

Henderson County: George Hoffman 1 R. D. Haynes et al., 3-P-26. IP 14 BOPD, 13 BWPD, Waltersburg 1,272-85 ft. TD 1,297 ft. Extension to South Reed field.

Muhlenberg County: Creek Oil Co. 1 Mrs. Annie Harper, 5-I-28. IP 35 BOPD, Benoist 1,908-21 ft., Renault 1,923-30 ft. TD 2,150 ft. New pay.

Ohio County: Beaver Dam Coal Co. 1

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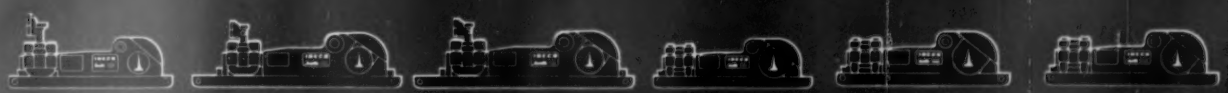

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Robert Luttrell, 8-L-32. IP 40 BOPD, Fern Glenn dolomite 1,808-15 ft. TD 3,311 ft. Opens North Hartford field.

Winkler County: Texaco Inc. 22 Seth Campbell, Sec. 23, Blk. B-3, PSL Sur., 2 miles northeast of Kermit. IP 204 BOPD, 26/64-in. choke, 34°, GOR 1,295:1, TP 80 psi., Clear Fork 5,124-5,258 ft. TD 5,303 ft. New pay discovery in South Kermit field.

LOUISIANA OFFSHORE

Vermilion Area: Zapata Offshore Co. 1-A OCS-0570, Block 104, Gulf of Mexico. IP 2,280 M.c.f.d., dry gas, 12/64-in., TP 2,912 psi., perf. 7,756-61 ft. TD 11,684 ft. New field.

SOUTH LOUISIANA

Vermilion Parish: Skelly Oil Co. 1 State Lease 3307, Township (no section) 15s-4e, in Vermilion Bay. IP 36 BOPD, 7,750 M.c.f.d., 8/64-in., 45.2°, TP 7,750 psi., perf. 15,470-80 ft., and 17 BOPD, 1,400 M.c.f.d., 10/64-in., 50°, TP 2,300 psi., perf., 14,990-15,000 ft. TD 16,025 ft. Second well and 8,600-ft. north extension of Redfish Point field.

MICHIGAN

Calhoun County: McClure Oil Co.-I. W. Hartman 1 Willis, SE SE NW 17-4s-6w, Tekonsha Township, 17 miles west Pulaski oil field. IPF 8 bbl. oil pump. Elev. 965 ft., Trenton 3,445 ft. TD 3,978 ft. Oil discovery.

Ottawa County: Carter Oil Co. 1 Adler, NW SE SE 34-5n-15w, Holland Township. AIP 2,100 M.c.f.d. Elev. 675 ft., Salina A-2 2,623, Salina A-1 2,780, Brown Niagara 2,992 ft. TD 3,042 ft. Perf. 2,634-50 and 2,794-2,810 ft. New pay in Fillmore Traverse field.

OKLAHOMA

Alfalfa County: Continental Oil Co. 1 Ida Fellers, NW NE 1-27n-12w. IP 216 BOPD, 34.6°, Red Fork 5,142-60 ft. TD 5,970 ft.

1 Meek "A," C SE NW 9-2n-25eCM. IP 10.2 M.c.f.d., Council Grove 3,508-12 ft., 3,514-20 ft., 3,530-34 ft., 3,542-50 ft. TD 5,786 ft. New pay in Mocane field.

SOUTHWEST TEXAS

Brooks County: Texaco, Inc., 1 G. G. Lopez, La Rucia Grant, A-481, 16 miles southwest of Encino. AOF 17 M.M.c.f.d., GLR 39.5 M.c.f. per bbl., 56°, shut-in TP 4,792 psi., perf. 8,436-50 ft., Vicksburg. TD 9,870 ft. New pay in Encinitas field.

Dimmit County: Ike Howeth et al, 1 H. J. Whitecotton, Blas Reyes Grant, A-4, 5 miles east of Carrizo Springs. IP 102 BOPD, 10/64-in., 36°, GOR 1,280 cu. ft. per bbl., TP 840 psi., perf. 3,550-52½ ft., Olmos. TD 6,005 ft. New pay and extension in Thirteen area.

LaSalle County: Frank C. Kallina and Ralph Evans 2 Holman Cartwright, Section 201, H&GN Sur., A-298, 10 miles south of Los Angeles. IP 50 BOPD, P-33 choke, 47°, GOR 1,600 cu. ft. per bbl., TP 480 psi., perf. 5,224-33 ft., Wilcox. TD 5,510 ft. New-field discovery—Cartwright.

Starr County: Sun Oil Co. 5-A J. F. Hall-State, Section 336, 29 miles northeast of Rio Grande City. IP 128 BOPD, 3/16-in., 43.3°, GOR 2,430 cu. ft. per bbl., TP 4,750 psi., perf. 6,204-14 ft., Frio. TD 10,123 ft. New pay in North Rincon field.

Webb County: Ralph Rowden and Hawn Brothers 2 Arnado Perez et al, Section 460, 8 miles north of Bruni. IP 68 BOPD (net), 80% water, P-37 choke, GOR 452 cu. ft. per bbl., TP 360 psi., perf. 5,551-55 ft., Queen City. TD 5,902 ft. New field—Malo Sueno.

TEXAS GULF COAST

Calhoun County: Slick Oil Corp. and General Crude Oil Co. 1 W. P. Frerich, Manuela Venitez Sur., A-39, 11 miles west of Port Lavaca. IP 104 BOPD, 10/64-in., 37.5°, GOR 870 cu. ft. per bbl. TP 650 psi., perf. 9,186-96 ft., Frio. TD 9,516 ft. New pay in West Sheriff field.

Chambers County: Tidewater Oil Co. 8 State Tract 87, Galveston Bay, 16 miles north of Texas City. IP 154 BOPD, 10/64-in., 40.6°, GOR 7,304 cu. ft. per bbl., TP 2,000 psi., perf. 8,506-18 ft., Frio. TD 8,850 ft. New pay in Umbrella Point field.

Jackson County: H. H. Howell, Cecil J. Cox et al, 1 C. F. Simmons, Section 5, Sutherland Pasture Subd., George Sutherland Sur., A-75, 4 miles south of Ganada. AOF 13 M.M.c.f.d., GLR 125 M.c.f. per bbl., 60.9°, shut-in TP 2,265 psi., perf. 5,784-86 ft., Frio, and 21 M.M.c.f.d., GLR 83 M.c.f. per bbl., 46.7°, 2,217 psi., perf. 5,553-55 ft., Frio. TD 7,138 ft. Extension and new pays in Stewart area.

W. L. Pickens 8 Owen, Lot 20, Pickering Ranch Subd., P. Scott Sur., 5 miles north of Lolita. IP 216 BOPD, 12/64-in., 31.8°, GOR 1,510 cu. ft. per bbl., TP 600 psi., perf. 6,498-6,501 ft., Frio, and 63 BOPD, 14/64-in., 31.6°, GOR 10 M.c.f. per bbl., 1,460 psi., perf. 5,914-18 ft., Frio. TD 6,735 ft. New pays in North La Ward field.

Tennessee Gas Transmission Co. 1-A Margaret H. Drushel, Lot 5, Gale Subd. of Hays Ranch, F. Rodruguez Sur., A-64, 5 miles northwest of Edna. AOF 10,300 M.c.f.d., dry gas, shut-in TP 1,996 psi., perf. 4,870-78 ft., Frio, and 15,300 M.c.f.d., dry gas, shut-in pressure 1,976 psi., perf. 4,806-13 ft., Frio. TD 7,410 ft. New pays in old Edna gas area.

San Patricio County: Texoil Corp. 5 E. Foote, M. P. and J. N. Delgado Grant, A-4, 2 miles southwest of Mathis. AOF 19,500 M.c.f.d., dry gas, shut-in TP 1,371 psi., perf. 3,164-69 ft., Frio. TD 5,250 ft. New pay in Willman field.

Victoria County: Morgan Minerals Corp. and Pontiac Refining Corp. 1 Mary E. Atkinson, Luciano Navarro Sur., A-89, 5 miles northeast of Mission Valley. AOF 3,100 M.c.f.d., GLR 57.6 M.c.f. per bbl., 60.5°, shut-in TP 2,170 psi., perf. 5,515-20 ft., Yegua. TD 8,832 ft. Extension and new pay in Richard Adcock area.

WEST CENTRAL TEXAS

Nolan County: F. W. Holbrook & Slick Oil Corp. 1 Pace, Sec. 3, Blk. X, T&P Sur., new pay and southwest offset to Ellenburger discovery of West Beckham field. IP 142 BOPD, 16/64-in. choke, TP 50 psi., 43°, GOR 61:1, Cisco 3,890-95 ft., TD 6,353 ft., ground elevation 2,444 ft.

WEST TEXAS

Andrews County: Santiago Oil & Gas Co. 1 Superior-University, Sec. 48, Blk. 13, University Lands Sur., new pay discovery in Shafter Lake area. IPP 97 BOPD, 35°, GOR 107:1, San Andres 4,635-81 ft. TD 4,732 ft., elevation 3,235 ft.

Cities Service Production Co. 1-F Brown, Sec. 21, Blk. A-41, PSL Sur., 12 miles southwest of Andrews, between Fuhrman-Mascho and Martin fields. IP 438 BOPD, 36/64-in. choke, 45°, GOR 220:1, TP 75 psi. Ellenburger 11,707-60 ft. TD 11,760 ft., elevation 3,257 ft.

Borden County: W. E. Bakke 1 Emma Lee Hughes, Sec. 408, Blk. 97, H&TC Sur., 4 miles south of Fluvanna. IP 169 BOPD, 47°, GOR 350:1, TP 560 psi., Pennsylvanian 7,901-09 ft. TD 8,376 ft., ground elevation 2,637 ft.

Crane County: Cosden Petroleum Corp. 1 W. N. Waddell, Sec. 21, Blk. B-20, PSL Sur., 20 miles west of Crane. IP 105 BOPD, 24/64-in. choke, 38°, GOR 1,743:1, TP 620 psi., Permian 3,830-42 ft. TD 7,552 ft.

Glasscock County: TXL Oil Corp. 1-41 TXL, Sec. 41, Blk. 34, T3S, T&P Sur., 4½ miles west of Garden City. IPP 109 BOPD, 35°, Spraberry 6,550-6,650 ft. TD 10,890 ft., elevation 2,718 ft.

Hockley County: Texaco Inc. 1 Wells, Sec. 112, Blk. A-36, R. M. Thompson Sur., ½ mile west of Anton. IPP 182 BOPD, 27°, GOR 55:1, Clear Fork 6,502,80 ft. TD 11,778 ft., PB 6,698 ft.

Irion County: Curtis R. Inman 1 McMillian, Sec. 26, J. L. Foster Sur., 5 miles southeast of Mertzon. IPP 42 BOPD, 38°, San Angelo 1,402-07 ft. TD 1,525 ft.

Loving County: Gulf Oil Corp. 1-AJ TXL, NCT-A, Sec. 27, Blk. 53, T2, T&P Sur., 9 miles northeast of Mentone. IPP 5 BOPD, Delaware 4,681-86 ft. TD 4,770 ft.

Martin County: Pan American Petroleum Corp. 2 Turnbow, Labor 10, League 259, Borden CSL Sur., Strawn discovery in Breedlove-Devonian field. Dual completion. IP 448 BOPD, 43/64-in. choke, 44°, GOR 1,630:1, TP 150 psi., Strawn 10,800-830 ft.; IP 553 BOPD, 10/64-in. choke, 41°, TP 1,100 psi., Devonian 11,989 ft. TD 11,992 ft.

Pecos County: Argo Oil Corp. 1 J. O. Neal, Sec. 42, Blk. OW, TTRR Sur., 20 miles northwest of Ft. Stockton. IP 547 BOPD, ¼-in. choke, GOR 1,500:1, 35°, Delaware 4,782-4,800 ft. TD 4,870 ft., ground elevation 2,695 ft.

Schleicher County: Chambers & Kennedy 1 Thornburg, Sec. 26, Blk. 8, TW&NG Sur., 25 miles east of Eldorado. IP 182 BOPD, 14/64-in. choke, 40°, GOR 1,479:1, TP 760 psi., pay 4,445-49 ft. TD 4,621 ft.

Sunray Mid-Continent Oil Co. 4 Williams, Sec. 78, Blk. M. GH&SA Sur., 8 miles south of Christoval. Recompletion. IP 1,620 M.c.f.d., of gas, Strawn 5,346-69 ft. TD 5,645 ft.

Ward County: Texaco Inc. 1-DE State, Sec. 8, Blk. 18, University Lands Sur., 11 miles northwest of Pyote. IP 7,100 M.c.f.d. of gas, Delaware 5,063-79, 5,102-12 ft. TD 5,120 ft.

Yoakum County: J. C. Williamson 1 Tyson Field, Sec. 59, Blk. D, John H. Gibson Sur., 8 miles snorth of Bronco. IP 723 BOPD, 32/64-in. choke, 46°, GOR 109:1, TP 150 psi., Devonian 11,994-12,030 ft. TD 12,030 ft., elevation 3,873 ft.

UTAH

Duchesne County: Standard Oil of California 3 Uintah-Ouray, C NW SW 5-1n-2w. IPP 306 BOPD, Wasatch discovery, new field. TD 13,354 ft. Cretaceous.

Independent Heads RMOGA

• Frank Gower, a top hand at handling leasing problems, takes over reins of Rocky Mountain association.

AN INDEPENDENT oil man who is considered one of the nation's top experts on federal leasing laws and regulations is the new president of the Rocky Mountain Oil and Gas Association.

In his new job as RMOGA president, Frank H. Gower, Denver, will have plenty of opportunity to use the leasing knowledge he has built up during his 37 years in the oil business. Mineral rights on most of the oil lands in the Rockies are owned by the federal Government.

Gower is probably best known as the author of Gower Federal Service, a comprehensive compilation of leasing laws and regulations on government lands. The service was merged into Rocky Mountain Mineral Law Foundation earlier this year.

Gower also is an active independent oil operator who has played a part in the discovery of Rocky Mountain oil fields. He has working interests in several fields primarily in Wyoming.

Left major company . . . Gower is an independent who left a good job with a major to see if he could "fall on my face or make a go of it."

He resigned as Rocky Mountain division landman for Texaco Inc. in 1948 to become an independent operator. Gower served with Texaco for 24 years, including 12 years as division landman in Denver.

Frank H. Gower
. . . he didn't fall on his face.

He says his success as an independent is "not because I was smart, but because I was lucky."

Gower probably has as much Rocky Mountain oil experience behind him as anyone in the business. All his 37 years in the business have been spent in the Rockies, and his only operation outside the Rockies is some royalty holdings in West Texas.

He says he has made some attempts to operate outside the Rockies, but always decides the area has more to offer than any other in the country.

A native of Fairfield, Ill., Gower came to Denver with his parents as a child. He attended public schools in Denver and studied at the University of Colorado, Denver University, and Westminster law school.

He entered the oil business in 1922, joining The California Co. in Shelby, Mont. He worked with Calco 2 years before going with Texaco. His son, Frank H., Jr., a geologist, is associated with him in his present operations.

RMOGA goals . . . Gower is a quiet, soft-spoken oil man who is expected to do an effective job as head of the six-state organization.

He says he has no pet projects he plans to initiate, but will press for oil men to take a bigger part in public affairs and become do-it-yourself public relations men for the oil industry.

Gower has set a good pattern for association members to follow with his long service in RMOGA. He is just completing a term as Colorado vice president for the association and formerly was chairman of the association's highly-important public-lands committee.

▶▶▶ Personals

Frank H. Gower, Denver independent (see above), has been elected president of the Rocky Mountain Oil and Gas Association. He succeeds **A. F. Barrett,** Billings, Mont., of Mobil Oil Co. Barrett served 2½ years as president. Three new vice presidents were elected at RMOGA's fourteenth annual meeting in Denver. **Leonard L. Aitken,** Denver, executive vice president of Utah South Oil Co., was named Colorado vice president to succeed Gower. **R. W. Gemmer,** Carter Oil Co. division manager at Billings, is the new Montana vice president, succeeding **Warren J. Hancock. Grant A. Brown,** Salt Lake City, general counsel for Utah Oil Refining Co., was elected to succeed **J. L. (Mike) Dougan** as Utah vice president. Two vice presidents were re-elected: **Warren A. Morton,** of Casper, for Wyoming-South Dakota and **James L. Parmelee,** of Omaha, for Nebraska.

Glenn A. Campbell, Tulsa drilling contractor and producer, has been named general manager of drilling and production for White Eagle Overseas Co., Inc., Manila, Philippines. White Eagle Overseas holds a 770,000-acre concession in the Philippines.

John R. Spencer, engineering section chief for Continental Oil Co. in Houston, has been promoted to director of natural gas activities, production department. He succeeds **J. W. Ferguson,** who just recently was named general manager of Conoco's new intrastate gas and gas products department. Spencer will continue to headquarter in Houston. Also, **F. B. Willson,** coordinator of natural gas sales in Houston, has been promoted to assistant director of natural gas activities. **B. L. Waggoner,** Oklahoma City division engineer, will succeed Spencer as engineering section chief in Houston.

C. P. Schweikhardt, engineer for Sohio Petroleum Co. in Oklahoma City, has been named production engineer in Galena Park, Tex.

M. H. (Hap) Chandler, senior gas construction engineer for Pacific Gas & Electric Co., has been named manager of the gas construction department. He will succeed **Joseph A. Love,** who will retire December 31. Chandler has been with the company since 1940.

Rex W. Smyth and **W. I. Leitzell** have joined the technical development section of Gulf Oil Corp.'s petrochemical department. They will assist in planning and development of new petrochemical projects for Gulf. Smyth was formerly group leader doing pilot plant research in petrochemicals for Gulf Research & Development Co. Leitzell was with Koppers Co. before joining Gulf. They will headquarter in Pittsburgh.

▶▶▶ Personals

Joseph L. Seger, executive vice president of Carter Oil Co., has been named to succeed **John W. Brice** as president and chief executive officer of Carter when reorganization of Standard Oil Co. (N. J.) domestic subsidiaries is completed. **Carl G. Herrington,** now Carter vice president, will succeed Seger as executive vice

SEGER

HERRINGTON

president. Brice will resign from Carter December 1 to become executive vice president and a director of the new Humble Oil & Refining Co. (Delaware). **H. W. Haight,** Carter chairman, will also resign December 1 to become vice president and a director of Humble. Brice will continue to headquarter in Tulsa; Haight will headquarter in Houston. Changes are subject to share holder approval of the proposed reorganization of Jersey's subsidiaries. Carter will operate as a division of the Humble company under the new setup. **Thomas Brownfield, W. W. Bryan, F. M. Darrough,** and **M. W. Haas** will continue as vice presidents and directors of Carter.

J. F. Homer, district superintendent for Humble Oil & Refining Co., has been transferred to Monahans, Tex., from Anchorage, Alaska.

Perry J. Lyons, formerly a chemist with Gulf Oil Corp. in Port Arthur, Tex., has joined Pfizer Laboratories, Houston, as a sales representative.

Robert Conkling, production engineer with Continental Oil Co., has been transferred to Craig, Colo., from Lance Creek, Wyo.

Sam Matthews, Oklahoma division engineer for Cities Service Oil Co., has been appointed assistant superintendent of the east Kansas production division. He succeeds **Coxey Evans,** El Dorado, Kans., who will retire December 1 after 40 years with the company. **William A. Dow,** assistant to the west Kansas division engineer in Great Bend, will succeed Matthews as Oklahoma division engineer.

Troy Michie, senior engineer with Carter Oil Co., has been transferred to Tulsa from Magnolia, Ark.

Kenneth A. Wagner has joined Amerada Petroleum Corp. in Charlson, N. D., as junior production engineer.

F. R. Wheeler has sold his interest in Chemical & Geological Laboratories, Casper, Wyo., to open offices as petroleum engineering consultant in Casper.

James K. Price has joined the production and exploration department of Monsanto Chemical Co.'s Lion Oil division in Denver.

Victor C. Cope, Jr., geologist for Phillips Petroleum Co. in Wichita, has been transferred to the economics department in Bartlesville, Okla.

Andrew L. Diehl, development engineer for Shell Oil Co., has been transferred from Bakersfield, Calif., to the Houston office of Shell Development Co. **James D. McLehaney** has been promoted from junior development engineer to development engineer in Shell's Farmington, N. M., office.

Emil Pfister, retired manager of technical matters in refining and petrochemicals for Asiatic Petroleum Corp., has joined Universal Oil Products Co., as a consultant. Pfister had been with the Royal Dutch-Shell companies since 1920 before his retirement from Asiatic.

Louis A. Weston, retail manager of Shell Oil Co.'s Los Angeles division sales department, has been named district manager in San Diego, Calif. He succeeds **S. L. Taylor,** who has been given a special assignment in the Los Angeles marketing division. **Frank M. Cookson,** Los Angeles division merchandising representative, will succeed Weston.

Fred R. Schroeder, Union Producing Co.'s vice president in charge of exploration, has been named vice president in charge of drilling and production operations. He succeeds **J. B. Storey,** who recently resigned to join Southdown, Inc., as vice president in charge of the oil and gas division. **T. W. Johnson,** Union's superintendent of production engineering, has been promoted to manager of drilling and production, a new position in the company. **B. J. Dowd,** assistant superintendent, moves up to superintendent of production engineering, succeeding Johnson.

George C. Edgerton, supervising engineer in Corpus Christi, Tex., for Humble Oil & Refining Co., has been transferred to Refugio, Tex., as district supervising engineer.

Rod A. Roderick, formerly geologist with Monsanto Chemical Co.'s Lion Oil division, has opened consulting offices in Houston. Roderick was with the U. S. Bureau of Mines, helium division, before joining Lion.

William H. Hitchcock, Jr., engineer in Texas Eastern Transmission Corp.'s gas division, has been given special construction assignments in the division. **James Y. Briggs,** engineer, has been named supervisor of the compressor station section; and **Frank V. Gordon,** engineer, has been appointed pipeline section supervisor.

E. W. (Woody) Adams, formerly chief scout with Gulf Oil Corp. in Midland, Tex., has been named manager of the Williams & Lee Scouting Service, Inc. Adams, also a co-owner of the service, will direct the commercial scouting organization handling data for West Texas and eastern New Mexico. A graduate of Texas Christian, Adams was with Gulf from 1945 to 1958. The new service expects to begin operation early in 1960.

Dr. Hollis D. Hedberg, vice president in charge of exploration for Gulf Oil Corp. was elected president of Geological Society of America at the group's recent annual convention in Pittsburgh. **Thomas B. Nolan** of U. S. Geological Survey, Washington, was elected vice president. Elected councilors were **Harold L. James,** also of USGS; **Vincent C. Kelley,** University of New Mexico; **George D. Woollard,** University of Wisconsin; and **Norman D. Newell,** Columbia University. GSA awards were made during the convention to **Dr. Adolph Knopf,** Stanford University; **Sir Edward Bullard** of Cambridge, England; and **Dr. Jack L. Hough.** Knopf received the society's Penrose medal, given in recognition of his research in pure geology. Bullard was winner of the Arthur L. Day medal for contributions to geologic knowledge through physics. The Kirk Bryan award, given to author of a published work in the field of geomorphology, went to Hough. Knopf is a past president of the society.

HEDBERG

▶ ▶ ▶ Personals

MAXWELL

Eugene L. Maxwell, regional exploration manager in Denver for Monsanto Chemical Co.'s Lion Oil division, has been named director of domestic exploration for Lion, a new position. He will headquarter in Houston. **Arthur L. Bergren, Jr.,** regional geologist, will succeed Maxwell as Rocky Mountain regional exploration manager. **Thomas W. Lins,** assistant regional geologist, will move up to succeed Bergren.

William J. Scott has been appointed district superintendent of Tidewater Oil Co.'s East Texas district, Kilgore, Tex. Scott was formerly with Getty Oil Co. in Los Angeles and in the Neutral Zone.

C. E. Beavers, Midland, Tex., district manager for Champlin Oil & Refining Co., has been promoted to secondary recovery engineer and transferred to Fort Worth.

Jack Hester, formerly with Phillips Petroleum Co., and **Bob Warfield,** formerly with Texaco Inc., have joined the geological staff of Cosden Petroleum Corp. in Midland, Tex.

J. B. Dickey, marketing manager for Continental Oil Co.'s Memphis division, has been promoted to coordinator of domestic wax sales, a new position. He will headquarter in Houston.

W. S. Svenson has been named assistant to the vice president, manufacturing, research, and engineering, for Standard Oil Co. of California. He succeeds **J. S. Detweiler,** who has been transferred to California Standard's Western Operations, Inc., on special assignment in the oils planning division, manufacturing department, in San Francisco.

I. C. Brown has been appointed manager of operations at the El Segundo, Calif., refinery of Standard Oil Co. of California, Western Operations, Inc. Brown was formerly manager of the Bakersfield, Calif., refinery. At California Standard's Richmond, Calif., refinery, **R. R. Bowles** has been named superintendent of the light oil division. **B. I. Roach** has been named assistant superintendent of the catalytic section, cracking division; and **T. R. Taylor** has been named technical assistant to the manager of operations.

Daniel A. Painter has joined Delhi-Taylor Oil Corp. as staff geologist, geological department, in Dallas.

Henry A. Brainerd, senior engineer with Sinclair Pipe Line Co., has been transferred to Independence, Kans., from Harvey, Ill.

Dan M. Jones, junior petroleum engineer in Sinclair Oil & Gas Co.'s production department, Pampa, Tex., has been transferred to the general engineering staff in Tulsa.

A. J. Alspaw, field foreman with British-American Oil Producing Co., has been transferred to Houston from Victoria, Tex.

Lowell B. Deckert, production engineer with Carter Oil Co. in Carmi, Ill., has joined Continental Oil Co. in Ponca City, Okla., as production engineer.

J. Fred Creel has been appointed manager of the Houston district sales office of Warren Petroleum Corp.'s natural-gasoline division. Creel was manager of Warren's West Coast district sales office until it was closed recently.

R. F. Stephenso, chief engineer of United Gas Pipe Line Co.'s Latex station, Panola, Tex., has been transferred to Mineola, Tex., as chief engineer of the compressor station there.

Kenneth F. Heddon, Sun Oil Co.'s district sales manager in London, Ont., has been named assistant manager of the western sales division, Detroit. He succeeds **Kenneth W. Cunningham,** who is now on special assignment.

Ralph J. Giannone, formerly with Signal Oil & Gas Co. in Midland, Tex., has joined the production and exploration department of Monsanto Chemical Co.'s Lion Oil division in Midland. **William T. Johnson,** formerly with Phillips Petroleum Co., has joined Lion Oil's sales department in El Dorado, Ark.

Dr. Charles H. Davenport, assistant director of research for Monsanto Chemical Co.'s Lion Oil division, has been promoted to European technical representative for Monsanto. He will headquarter in Geneva, Switzerland. Davenport succeeds **Dr. David S. Weddell,** who will become assistant director of development for Monsanto's overseas division January 1. Weddell will headquarter in St. Louis.

Remick McDowell, executive vice president of Peoples Gas Light & Coke Co., has been named to succeed **Joseph J. Hedrick** as president of the company. Hedrick will retire January 1. **Robert M. Drevs,** secretary, has been elected a vice president of Peoples Gas. McDowell came to Peoples Gas in 1940 from Commonwealth Edison Co. He has been executive vice president since 1957 and was a vice president before that time. Hedrick joined Natural Gas Pipeline Co. of America, a subsidiary, in 1930. He became president of that company in 1949 and president of Peoples Gas in 1957. He is a past president of Independent Natural Gas Association and has been a director of the American Gas Association. Hedrick also retires as vice chairman of the board of Natural Gas Pipeline. He will continue as a consultant to companies of the Peoples Gas system and as a director of the production, pipeline, and storage subsidiaries.

McDOWELL

H. T. Richardson, formerly chief geologist for Standard Oil Co. of Texas, has been appointed acting general manager of exploration.

Perry McClanahan, tool pusher with Penrod Drilling Co. in Dallas, has joined J & B Drilling Co., Inc., DeQuincy, La., as tool pusher.

S. Douglas Turner, Alberta division manager for Canadian Petroleum Association since 1954, has been named general manager of the new Big Inch Pipe Corp., Ltd. **James Blakely Corbet,** formerly with the Alberta Department of Mines and Minerals, will succeed Turner as Alberta manager for the association.

D. R. Arnold, Signal Oil & Gas Co., received California Natural Gasoline Association's meritorious achievement award at the recent annual fall meeting in Pasadena. The award recognizes service to CNGA and the natural-gas industry from an outstanding young man in the industry. Service awards of merit were presented **James E. Adams,** Signal; **R. A. Montague,** Standard Oil Co. of California; **W. W. Warneke,** Chanslor Western Oil & Development Co.; and **R. D. Woods,** Honolulu Oil Corp.

Personals

E. J. Wacker, Jr., formerly assistant to the senior vice president of Mobil Oil Co., has been elected vice president of the expanded Magnolia Pipe Line Co. He will be concerned with engineering, electrical, research, and other activities. Magnolia Pipe Line recently took over eastern and midwestern pipeline systems of Mobil Oil. Wacker joined the pipeline company as a mechanical engineer in 1939 after graduation from the University of Texas. He was a vice president of Magnolia Petroleum Co. before merger of Magnolia and Mobil last month.

Jack H. Rice, manager of Ohio Oil Co.'s pipeline department, has been named president of Marathon Pipe Line Co., newly organized Ohio Oil subsidiary. The new company will take over all Ohio pipelines by January 1.

Edwin Goodwin, sales manager for Texas Iron Works, Houston, has resigned after 33 years with the company. He will devote full time to his position as owner and president of United Drilling Co.

Harry K. Armstrong, formerly with Atlantic Refining Co. as superintendent of the Seminole, Okla., district, has joined W. E. Stiles Engineering, Inc., Tulsa, as superintendent of production operations in the Oklahoma area.

Richard W. Robinson, petroleum engineer with Esso Research & Enginering Co. in Linden, N. J., has been transferred to Enjay Co., Inc., in Chicago as sales engineer.

Owen Vanderbilt, engineer with Houston Texas Gas & Oil Corp. in St. Petersburg, Fla., has joined Houston Pipe Line Co. as engineer. He will headquarter in Houston.

Robin J. Corbett, assistant to the president of Sharples Oil Corp., has been promoted to coordinator of producing activities. **George M. Schneider,** Rocky Mountain district manager, will succeed Corbett as assistant to the president. Sharples has closed its Midland, Tex., office. Operations handled there will be transferred to the Denver office.

Milo I. Hector, southern regional manager for Standard Oil Co. (Ind.) in St. Louis, has been named eastern regional manager in Detroit. He succeeds **Albert V. Fraser,** who was recently appointed assistant general manager of sales in the Chicago general office. **Robert L. Coates,** northwest region marketing manager in Minneapolis, will succeed Hector in St. Louis.

E. J. Northwood, formerly chief geophysicist for Dominion Oil, Ltd., in Trinidad, has been appointed superintendent of the geophysical division, western region exploration, for The California Co. Both companies are subsidiaries of Standard Oil Co. of California. Northwood succeeds **J. E. McCall,** who has been transferred to California Standard's Western Operations, Inc.

Loren L. Ware, Sinclair Oil & Gas Co.'s vice president for exploration, has been named coordinator for geological, geophysical, land, scouting, and conservation and proration. **Angus A. Davidson,** general attorney for Sinclair, has been given additional duties

WARE

DAVIDSON

as legal coordinator. He will coordinate legal, lease, tax, claims, and FPC matters. Ware joined Sinclair in 1944. He has been Fort Worth division exploration superintendent, assistant division manager in Midland, Tex., and general superintendent of exploration in the Tulsa headquarters. He was named a vice president in 1958 and a director this year. Davidson joined the Sinclair companies in 1926. He became counsel for Sinclair Pipe Line Co. in 1953 and general attorney for Sinclair Oil & Gas in 1956.

Ron Ruefenacht and **Don Schlotterbeck,** senior engineers at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., have been promoted to group heads.

Donuil M. Hillis, former chief geologist of Capital Co., has been elected president and a director of Four Corners Oil & Minerals Co. He succeeds **Edward A. Koester,** who recently resigned to return to consulting work.

Deaths

William R. Boyd, Jr., ninth president of the American Petroleum Institute, died November 6 at his home in Teague, Tex. He was 74. Boyd joined the API in 1920, soon after it was formed. He served as executive vice president from 1929 to 1941 and as president from then until the end of 1949. His service to the industry was noted last week in Chicago in a resolution adopted by the API board of directors (p. 123).

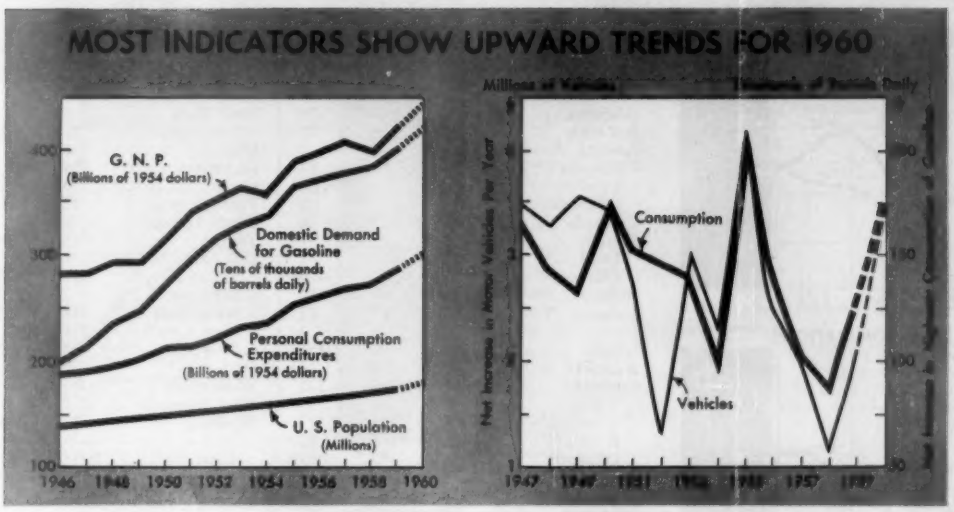
Lester J. Richards, 65, retired director of engineering for Dow Chemical Co., died November 2 at his home in Midland, Mich. Richards joined Dow in 1917 after graduation from the University of Michigan. He became chief engineer of Midland operations in 1934 and director of engineering in 1950. He retired in 1958 but continued as a consultant with Dow.

Gordon B. Crary, senior partner in E. F. Hutton & Co. investment firm in Los Angeles, died November 8 in a Los Angeles hospital. Crary was a director of Tidewater Oil Co., Mission Development Co., and La Brea Canyon Oil Co.

James C. Collins, 64, Mount Pleasant, Mich., independent cable-tool drilling contractor, died November 2 after a heart attack.

James Nardi, 62, chief mechanical engineer of Ford, Bacon & Davis, Inc., New York consulting firm, was among those killed in the October 30 crash of a Piedmont Airlines plane in Virginia. A graduate of the University of Illinois, Nardi joined Ford, Bacon & Davis in 1935. He had been chief mechanical engineer since 1950.

K. A. Beede, general superintendent of plants in the New York region for American Oil Co., died October 23 after a brief illness. Beede joined Amoco in 1926. He was superintendent of the Rensselear, N. Y., terminal before being named general superintendent of plants.



Strike insures next year's gains

BY JOHN C. CASPER

PART OF THE GAIN expected in the over-all economy for 1960 can be credited to the steel strike. The same is true for petroleum demand.

Most of this year's gain in gross national product came in the first half of the year. The general economic level was low in the first half of 1958. Recovery from the short recession started in the third quarter of the year and continued through the first half of 1959.

Thus, the recovery quarters of 1959 have been compared with the recession quarters of 1958. Total value of all goods and services in the first quarter of this year topped the year-earlier figure by a little over 10%. The gain for the second quarter was 12.6%.

Petroleum demand showed the same type of gain. Domestic demand in the first quarter of this year represented a gain of 7.2% over the corresponding quarter of 1958. The second quarter gain was 5.7%. Current reports indicate an increase of only 3.2% in the third quarter. And, unless the weather is cold for the remainder of the year, fourth-quarter demand may be up only 2.5% over the same period last year.

If steel's labor problems can be settled without further loss of production, the general level of the national economy will be high in 1960. Demand for petroleum products will show a good gain.

But, because the steel strike had its greatest depressing effect in the third quarter this year, normal gains in 1960 would result in high percentage increases in the third quarter of that year.

The chart also shows personal consumption expenditure which is a part of gross national product. The percentage gain rate in this segment of the total is expected to be larger than the percentage increase for total GNP. Some of the important gains will be in purchases of durable goods, particularly automobiles.

Sales of new cars in the last half of this year have been restricted by decline in production during the steel strike. If there is no interruption in the steel supply next year, the sale of new cars and trucks should produce a net addition to the motor-vehicle fleet of almost 3.5 million units. This gain will top any of the past 4 years and will be in line with additions in the early postwar period.

This gain in the number of cars and trucks will result in higher demand for gasoline. The increase in highway consumption of gasoline next year will be the largeest since the postwar record gain of 208,000 bbl. daily for the year 1955.

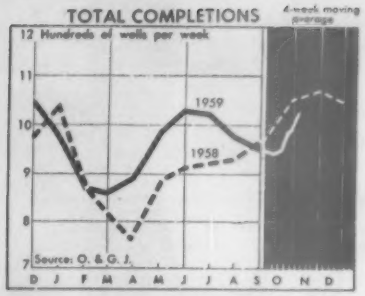
Since there has been such close correlation between net increases in motor-vehicle registrations and gains in highway gasoline consumption, some economists have raised the question of the effect of the compact car on gasoline demand. The effect will tend to be cumulative, and there will be little reduction in average consumption per vehicle for several years.

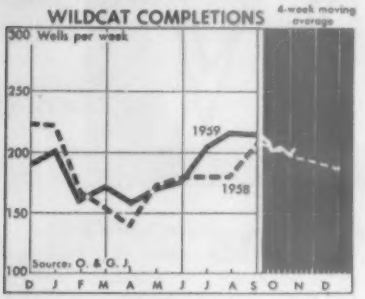
Total gasoline demand will not show the same percentage gain next year that is expected for highway gasoline. The over-all total will be influenced by the trend toward greater use of jet aircraft and reductions in demand for aviation gasoline.

A quick look at the highlights

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,926,320	UP	15,870	DOWN	75,977
Crude stocks	256,299,000	UP	3,230,000	UP	579,000
Completions	1,116	UP	88	DOWN	11
Refinery runs	7,681,000	UP	190	DOWN	5
Gasoline stocks	175,800,000	DOWN	347,000	UP	6,590,000
Kerosine stocks	32,764,000	DOWN	271,000	UP	395,000
Distillate stocks	181,624,000	UP	78,000	UP	16,270,000
Residual stocks	57,799,000	DOWN	251,000	DOWN	10,296,000
Four-product stocks	447,987,000	DOWN	791,000	UP	12,959,000
Total imports	1,318,000	DOWN	346,500	DOWN	291,100

DRILLING





Active Rotary Rigs

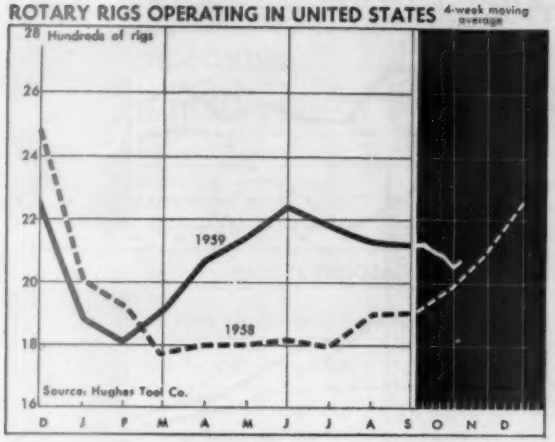
	11-9-59	11-2-59	11-10-58
Alabama	6	5	14
Arkansas	16	16	25
Arizona	1	1	2
California	91	97	83
Land	84	90	(*)
Offshore	7	7	(*)
Colorado	46	50	26
Florida	3	3	1
Land	2	2	1
Offshore	1	1	0
Illinois	43	44	57
Indiana	9	7	12
Iowa	0	0	3
Kansas	146	143	156
Kentucky	7	8	6
Louisiana	309	316	312
North	39	44	37
S. Inland waters	109	113	147
S. Land	105	107	91
Offshore	56	52	37
Maryland	0	0	1
Michigan	39	37	9
Mississippi	72	68	57
Missouri	0	0	1
Montana	30	24	26
Nebraska	27	19	28
Nevada	1	1	0
New Mexico	120	120	98
New York	0	0	2
North Dakota	21	23	31
Ohio	2	4	5
Oklahoma	224	229	239
Oregon	0	0	0
Pennsylvania	12	13	8
South Dakota	6	5	0
Texas	755	719	722
S. Inland waters	4	3	3
S. Land	190	176	121
Offshore	2	4	0
North-East	188	185	155
West Central	216	212	275
West	155	139	168
Utah	30	30	41
Washington	1	2	1
West Virginia	5	5	4
Wyoming	89	83	74
Total U. S.	**2,111**	2,072	2,044
Western Canada	165	170	156
Eastern Canada	1	1	3
Grand total	2,277	2,243	2,203

Hughes Tool Co. report. *Comparisons not available due to change in method of reporting.

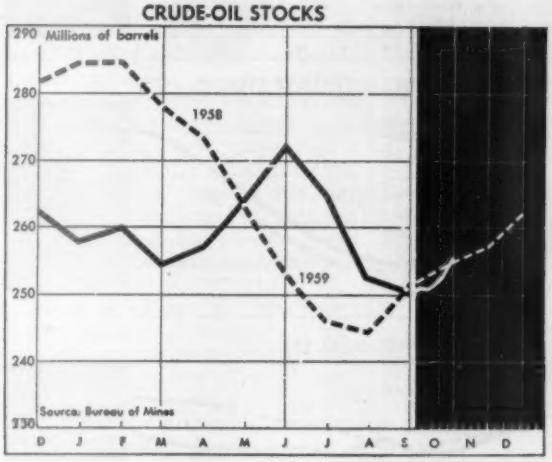
WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 7, 1959

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	2	2	0	0	0	0	23,198	82	68	0	0	0	0	0	20	26
Arizona	0	0	0	0	0	0	0	24	...	0	0	0	0	0	22	...
Arkansas	17	11	0	1	5	0	52,486	719	687	1	0	0	0	1	125	140
California	28	13	0	3	12	0	117,766	1,312	1,294	9	0	0	1	8	345	316
Colorado	23	5	0	3	15	0	77,254	661	732	5	1	0	0	4	371	426
Illinois	96	38	0	0	38	20	213,986	2,002	1,941	17	4	0	0	13	333	389
Indiana	22	10	0	0	11	1	33,650	714	721	6	1	0	0	5	243	262
Kansas	69	31	0	2	35	1	262,522	3,377	3,411	25	2	0	0	23	894	711
Kentucky	134	107	0	0	27	0	81,419	2,346	1,519	24	1	0	0	23	285	147
Louisiana	66	31	5	3	27	0	434,824	3,188	2,942	14	0	0	0	14	439	441
North	34	19	0	2	13	0	110,055	1,253	1,132	6	0	0	0	6	198	191
South	29	10	4	1	14	0	324,769	1,591	1,445	8	0	0	0	8	226	226
Offshore	3	2	1	0	0	0	30,931	344	365	0	0	0	0	0	15	24
Michigan	18	7	0	0	11	0	55,676	562	376	6	0	0	0	6	154	129
Mississippi	16	7	0	0	9	0	159,657	551	339	7	1	0	0	6	241	152
Montana	7	3	0	1	3	0	39,024	280	279	2	0	0	0	2	91	112
Nebraska	21	1	0	0	20	0	124,366	773	624	12	0	0	0	12	336	292
New Mexico	34	21	0	7	6	0	139,282	1,770	1,664	3	0	0	0	3	204	229
West	14	6	0	7	1	0	56,633	798	815	0	0	0	0	0	53	91
East	20	15	0	0	5	0	82,649	972	849	3	0	0	0	3	151	138
New York	20	12	0	1	0	7	26,938	237	463	0	0	0	0	0	19	41
North Dakota	9	6	0	0	3	0	57,175	381	400	1	0	0	0	1	68	125
Ohio	44	25	0	9	8	2	108,793	923	881	2	0	0	1	1	26	14
Oklahoma	108	58	3	6	38	3	439,399	4,733	5,408	14	2	0	2	10	722	731
Pennsylvania	0	0	0	0	0	0	0	441	528	0	0	0	0	0	10	19
South Dakota	0	0	0	0	0	0	0	15	...	0	0	0	0	0	7	...
Texas	324	198	11	10	98	7	1,388,465	15,998	15,392	61	5	2	0	54	3,007	3,121
Dist. 1	15	6	0	0	9	0	58,151	918	852	8	1	0	0	7	285	337
Dist. 2	11	1	1	0	9	0	66,414	673	636	5	0	0	0	5	201	167
Dist. 3	14	7	0	1	6	0	71,391	1,016	1,095	3	0	0	0	3	201	249
Dist. 4	19	6	1	3	8	1	90,714	1,143	999	4	1	0	0	3	275	297
East	31	22	2	1	6	0	138,671	1,091	1,050	4	0	0	0	4	206	289
Dist. 7-B	64	38	3	1	20	2	181,088	2,217	2,115	12	2	2	0	8	592	573
West	102	71	1	2	26	2	566,340	4,829	4,397	16	0	0	0	16	661	610
Dist. 9	46	33	1	0	10	2	113,494	3,005	3,116	8	1	0	0	7	494	491
Dist. 10	22	14	2	2	4	0	102,202	1,106	1,132	1	0	0	0	1	92	108
Utah	3	1	0	0	2	0	22,778	259	337	3	1	0	0	2	72	76
West Virginia	19	2	0	13	2	2	42,193	670	630	0	0	0	0	0	27	15
Wyoming	35	13	0	5	16	1	187,202	834	642	12	0	0	0	12	295	210
Misc. (Fla.)	1	0	0	0	1	0	6,033	82	82	1	0	0	0	1	55	72
Total U. S.	**1,116**	602	19	64	387	44	4,094,086	42,934	41,360	**225**	18	2	4	201	8,411	8,196
Previous week	1,028	543	30	87	331	37	4,293,912	.....	.....	168	10	0	9	149	.....	.....
Cum. 1959	42,934	21,382	1,046	3,185	16,105	1,216	177,565,746	.....	.....	8,411	755	96	274	7,286	.....	.....
Cum. 1958	41,360	20,360	954	3,107	15,849	1,090	168,442,237	.....	.....	8,196	793	136	224	7,043	.....	.....
Western Canada	75	43	0	12	17	3	467,904	2,079	2,122	18	3	0	4	11	573	567

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	10-31-59	10-24-59	11-1-58
Pennsylvania	2,509	2,549	2,741
Other Appalachian	2,145	2,117	1,941
Illinois, Indiana, Michigan	10,155	9,666	9,460
Nebraska and North Dakota	3,223	3,130	2,576
Kansas	9,817	9,310	10,448
Oklahoma	15,841	14,950	17,484
Arkansas	2,184	2,097	2,035
Louisiana	18,911	17,763	17,114
North	3,339	3,305	2,898
South	15,572	14,458	14,216
Mississippi, Alabama, Florida	2,364	2,183	2,569
New Mexico	8,427	8,630	7,574
Texas	111,295	111,398	110,162
East Texas	7,889	8,017	8,304
West Texas	53,150	52,676	53,916
Texas Gulf	19,225	19,886	19,852
Other Texas	31,001	30,819	28,090
Wyoming	16,157	16,405	13,401
Other Rocky Mountain	9,546	9,606	9,647
California	28,133	28,577	33,395
Foreign	†15,592	14,688	15,173
Total	**256,299**	253,069	255,720

*Bureau of Mines. †Includes 4,311,000 bbl. in California.

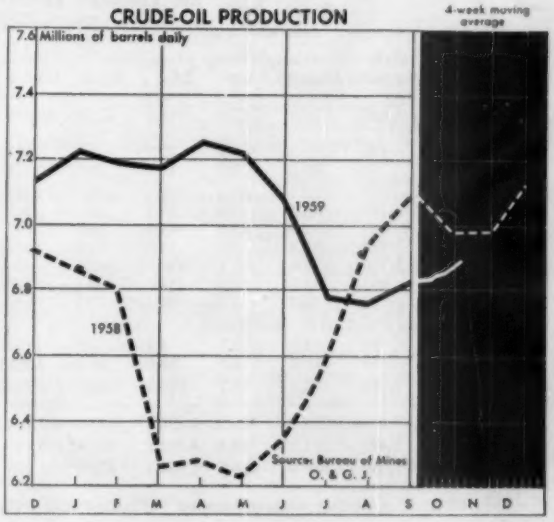
DAILY AVERAGE PRODUCTION FOR WEEK

	November 7, 1959 Crude oil	Lease condensate	Total	October 31 total
Alabama	16,300	.....	16,300	16,150
Arkansas	52,350	250	52,600	52,650
California	837,300	.....	837,300	841,400
Colorado	127,200	.....	127,200	127,300
Eastern	42,000	.....	42,000	41,500
Florida	1,170	.....	1,170	1,150
Illinois	219,200	.....	219,200	218,600
Indiana	32,500	.....	32,500	32,200
Kansas	†317,590	.....	†317,590	†334,580
Kentucky	75,700	.....	75,700	75,300
Louisiana	922,500	116,100	1,038,600	1,019,750
North	107,500	5,600	113,100	113,500
South	815,000	110,500	925,500	906,250
Michigan	32,100	.....	32,100	31,300
Mississippi	140,050	4,100	144,150	141,730
Montana	80,800	.....	80,800	81,750
Nebraska	66,400	.....	66,400	66,000
Nevada	100	.....	100	100
New Mexico	288,600	5,550	294,150	292,400
North Dakota	44,100	.....	44,100	47,500
Oklahoma	†543,200	.....	†543,200	†540,800
Texas	2,443,000	80,200	2,523,200	2,485,600
Dist. 1	43,000	2,800	45,800	44,500
Dist. 2	104,000	8,400	112,400	109,700
Dist. 3	318,000	38,000	356,000	351,000
Dist. 4	171,000	9,600	180,600	178,600
Dist. 5	25,000	400	25,400	27,300
Dist. 6	102,000	9,500	111,500	112,000
East Texas field	133,000	.....	133,000	130,000
Dist. 7-B	126,000	180	126,180	122,170
Dist. 7-C	118,000	3,320	121,320	118,230
Dist. 8	996,000	5,000	1,001,000	972,500
Dist. 9	201,000	2,000	203,000	201,600
Dist. 10	106,000	1,000	107,000	108,000
Utah	88,700	.....	88,700	111,580
Wyoming	348,900	.....	348,900	350,750
Others	‡360	.....	‡360	‡360
Total U. S.	6,740,620	206,200	**6,926,320**	6,910,450
Change from prev. week up	.....	.....	**15,870**	.....
Canada	†457,405	.....	†457,405	†526,000

Total U. S. Prod.-Jan. 1-Nov. 7 ..... 2,189,843,920 bbl.
Same period last year (crude plus cond.) ..... *2,067,015,690 bbl.

*Includes 49,247,030 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota and Washington.

CRUDE-OIL PRODUCTION



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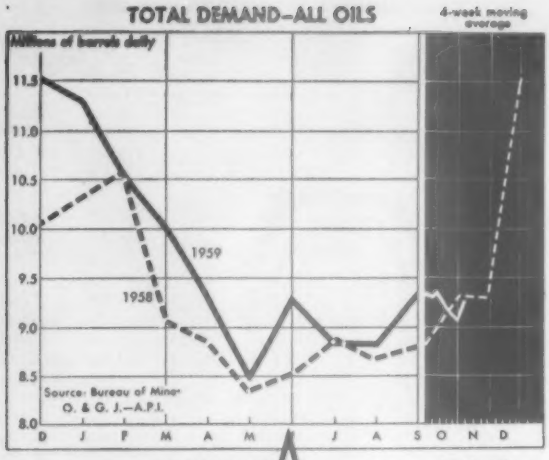

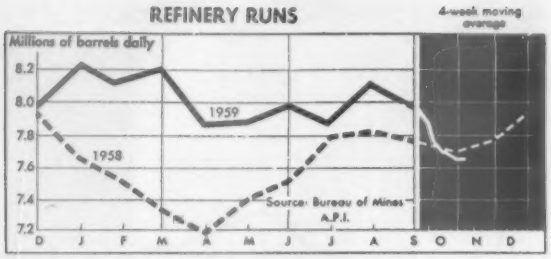

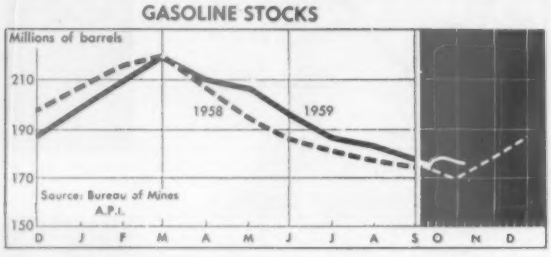

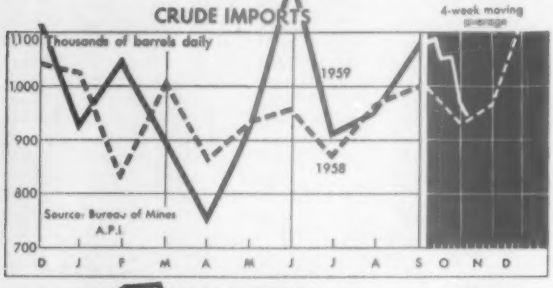

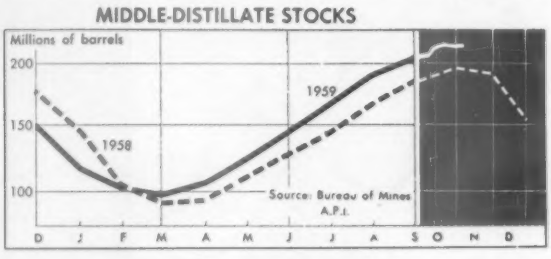

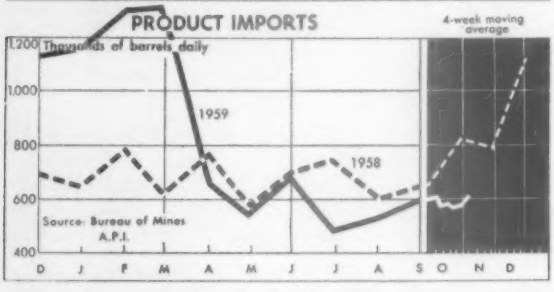

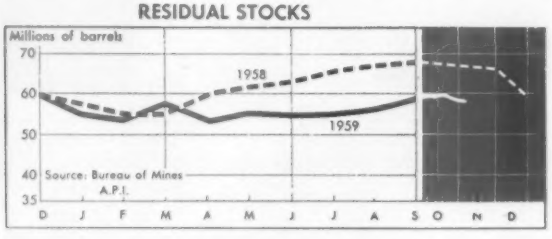

API REFINERY REPORT—NOVEMBER 6, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1958 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,052	475.5	22.9	315.8	126.9	40,469	14,188	72,409	11,189	1,107	491.7	34.4	347.1	168.7
Appalachian:														
District 1	100	42.3	2.4	20.7	8.9	5,617	702	4,838	481	95	41.1	3.9	19.7	10.0
District 2	93	49.6	7.0	17.3	10.1	2,715	646	2,000	555	102	50.7	4.7	18.8	12.4
Ind., Ill., Ky.	1,374	727.3	67.3	308.1	138.3	29,544	7,127	30,701	6,775	1,401	745.2	70.1	299.9	174.0
Minn., Wis., Dak.	112	55.3	2.6	29.3	14.1	6,908	1,415	8,157	487	106	50.3	6.3	28.4	11.8
Okla., Kans., Mo.	662	375.7	17.7	155.9	26.9	17,690	1,631	11,842	983	702	383.5	14.4	173.8	21.2
Inland Texas	304	231.6	9.6	51.0	17.9	7,008	550	1,776	2,296	288	213.8	9.1	49.0	19.9
Tex. Gulf Coast	1,778	876.4	107.1	438.6	143.9	20,961	3,175	21,541	6,274	1,804	958.7	126.1	446.7	191.0
La. Gulf Coast	695	378.6	69.4	151.0	54.1	9,399	1,690	7,628	1,571	680	384.9	72.1	164.4	47.4
N. La. and Ark.	70	39.7	1.0	19.1	7.1	5,050	885	2,437	283	82	43.1	3.2	20.7	6.1
Rocky Mountain:														
New Mexico	28	14.6	1.3	4.3	3.1	764	58	203	46	25	12.9	0.4	4.6	2.5
Other	267	130.3	3.9	55.6	29.3	4,465	327	2,853	1,298	271	131.8	2.2	63.2	33.4
West Coast	1,146	542.4	11.7	159.4	288.8	25,210	370	15,239	25,561	1,113	520.0	3.1	175.8	280.3
Nov. 6, 1959	7,681	3,939.3	323.9	1,726.1	869.4	175,800	32,764	181,624	57,799	7,776	4,027.7	350.0	1,812.1	978.7
Oct. 30, 1959	7,491	3,891.3	268.6	1,692.7	897.0	176,147	33,035	181,546	58,050	.....	.....	.....	.....	.....
Nov. 7, 1958	7,686	3,950.4	326.6	1,764.4	978.4	169,210	32,369	165,354	68,095	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Cool weather brings improved distillate markets

DISTILLATE FUEL PRICES have been a little firmer on the Group 3 market, and heavy fuel shows some signs of being influenced by the return to steel production. These have been the only important price trends over the past week.

Gasoline prices have shown no important changes, but there is some indication of slightly softer markets. In the Group 3 area, the normal price on sales to private-brand distributors is 10.75 cents a gallon for regular grade. A large distributor may be able to buy for 10.5 cents, but in many cases he also acts as a reseller, making deliveries to small jobbers.

The price of 10.75 cents a gallon is the lowest early-November price since the fall of 1954. There was a drop to this level in December 1956 and there have been several low periods during the winter months, but the pressure on inland gasoline prices has been both severe and early this year.

The influence of Gulf Coast prices is showing up as a tendency to narrow the gap between premium and regular prices in the Group 3 area. There has been a spread of 3.0 cents a gallon on sales of branded gasolines, but private-brand distributors have been buying premium at 2.75 cents over quotations for regular. Recent reports show that some unbranded premium may be selling at 2.5 cents over regular.

Chicago gasoline prices are so low that normal barge shipments out of the Gulf Coast area can't compete with local prices. The Chicago wholesale price for 91-octane regular is about 11.5 cents a gallon. On the Gulf Coast, the cargo price for 90-octane regular is 10.5 cents. The difference of 1.0 cent will not cover barge and terminal costs which average about 1.5 cents a gallon.

Residual fuel is strong on the Gulf Coast at $2 a barrel. Colder weather and increased industrial activity on the East Coast will tend to remove some of the below-market fuel in the New York Harbor area.

Carter Oil Co. announced a cut of 25 cents a barrel in 40°-gravity crude from Cut Bank field and a shift to 3 cents per degree of gravity change. The cut meets earlier reductions announced by Phillips Petroleum Co. and Union Oil Co. of California.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill§ Calif.	Oklahoma	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 9-12-59.

§Union Oil Co. of California posting up to 25c less per barrel.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.95
West Virginia	3.77
Buckeye Grade	3.62
Illinois Basin	**3.90**

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.86
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (91 octane)	10.75-11.25
Premium (99 octane)	13.50-14.00
Natural gasoline (26-70)	4.5
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.50-10.75
Regular (92 octane)	10.75-11.00
Premium (98 octane)	12.00-12.25
California (rack) (Los Angeles):	
Regular (88 octane)	11.65-12.25
Premium (94 octane)	12.65-13.25
Premium (100 octane)	14.15-14.50
Caribbean area (cargoes):	
Regular (87 octane)	10.375
Premium (97 octane)	12.00

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	9.75
★ Diesel oil (58 d.i. and above)	9.50
★ Distillate No. 1	9.50
★ Distillate No. 2	8.75
Gulf Coast (cargoes):	
Kerosine 41-43	8.625
Distillate No. 2	8.125
New York Harbor (barges):	
Kerosine 41-43	9.60
Distillate No. 2	9.10
Diesel fuel, 48-52 d.i.	9.40
Caribbean area (cargoes):	
Distillate No. 2	8.125

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$1.50-1.60
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
★ Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-USNH, dirty (ATRS—35%)	$1.85
Gulf-USNH, clean (ATRS—25%)	2.14
Carib-UK, dirty (Scale—47.5%) (17s. 1d.)	2.39
★ PG-UK, dirty (USMC—67.5%)	4.13

★Denotes change from previous week.

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FOR SALE EQUIPMENT

1 BUCYRUS—ERIE 36L Spudder, late model. Rig complete with tools and equipment. Cassel Drilling Co. Inc., Dumas, Texas. Phone WE 5-5019 or WE 5-4369.

BUDA POWER UNITS: Unused surplus, new condition. Four cylinder, 121 HP Gasoline Engines. Complete with Radiator, Twin Disc Clutch and 5 Sheave V Belt Drive Pulley. Can be operated on LP or Natural Gas. Priced at fraction of cost, $1495.00 each. Photograph and complete specifications on request. Oildfield Equipment Co., 430 West Seymour Ave., Cincinnati 16, O.

FOR SALE—126' Lee C. Moore High Speed Cantilever Type Portable Mast, 9' x 16' x 45' Substructure with 3' Extensions, Wilson Giant single drum drawworks, complete with two engine compound, Oilwell 20½" rotary table with torque converter, 7½ x 16 Bethlehem G-300 Pump. Excellent condition guaranteed. Kirkpatrick Oil Co., 1300 N. Broadway, Oklahoma City, Phone CE 9-1416.

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100,000 ft. 13⅜" O.D. 40#
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LIQUIDATION

at ESSO REFINERY, Baltimore, Md.

MOST EQUIPMENT NEW 1955

TOWERS

10' x 145'—125 PSI 50 trays
9' 6" x 121' 6"—325 PSI 30 trays
9' 6" x 106' 7"—150 PSI 20 trays
8' 6" x 103' 6'—165 PSI 24 trays
7' x 82'—75 PSI 30 trays
6' x 80'—300 PSI 30 trays
4' x 44' 6"—150 PSI 12 trays
3' 6" x 36' 4"—400 PSI 12 trays
3' x 29'—378 PSI 14 trays
30" x 43' 6"—180 PSI 24 trays
30" x 48'—350 PSI Packed
30" x 52' 4"—360 PSI 22 trays
26" x 57'—78 PSI 4 trays

REBOILERS

Sq. Ft.	Dimension	Tubes	PSI
2700	58" x 23' 5"	¾" Admir	150
2100	37" x 192"	1" Steel	165
2050	36" x 216"	¾" Admir	150
1020	32" x 196"	1¼" Steel	175
768	22" x 192"	¾" Steel	300
625	60" x 24'	1" Cu Ni	85
456	20" x 27'	¾" Steel	375

HEAT EXCHANGERS AND CONDENSERS

Steel	tube	7500	to	100	sq. ft.
Adm.	tube	3500	to	236	sq. ft.
Cu. Ni	tube	2330	to	308	sq. ft.

INGERSOLL RAND BLOWERS

1—2000 HP Motor Driven 26700 CFM 15 PSIG Discharge
1—1700 HP Turbine Driven 22500 CFM 15 PSIG Discharge

PUMPS

HOT OIL—5150 GPM to 100 GPM
Motor and Turbine driven
CENTRIFUGAL—12650 GPM to 25 GPM
Motor and Turbine driven
STEAM—Simplex and Duplex (20)

PRESSURE DRUMS

12' x 50' to 4' x 10'—325 to 50 PSI

FURNACE TUBES

68—6" x ⅜" x 27' 6", 3.75% Ni 8% Cr.
144—4" x ⅜" x 29' Croloy 5

TRANSFORMERS

750 KVA Standard 2400/4160-480
333 KVA Maloney 2400/4160-480
250 KVA Maloney 2400/4160-480

CLARK COMPRESSORS

1—Two Stage CENTRIFUGAL
7860 CFM-153 PSIA 2000 HP
3—RA5 Gas Engine with
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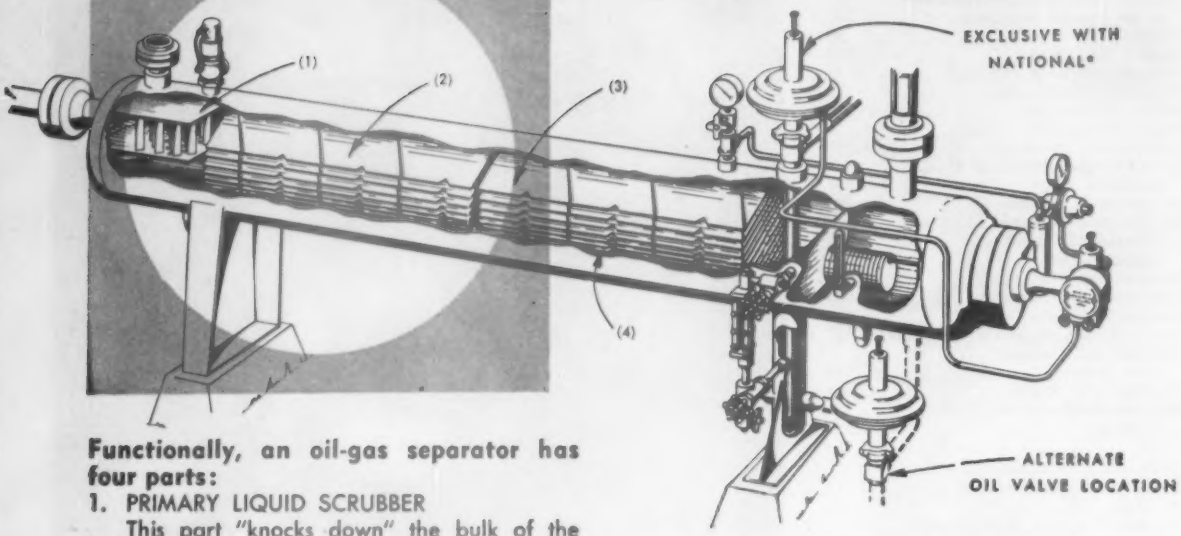

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